OFF

TECHNOLOGY *Foresight*

PROGRESS THROUGH PARTNERSHIP

Fore*sight*

First Progress Report

1996

Office of Science and Technology

DEPARTMENT OF TRADE AND INDUSTRY

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TECHNOLOGY *Foresight*

Technology Foresight is a key policy initiative first announced in the White Paper on Science, Engineering and Technology. It is coordinated by the Office of Science and Technology in the DTI. It embraces the dual themes of partnership and wealth creation. It brings together industrialists and scientists to identify opportunities in markets and technologies likely to emerge during the next 10-20 years, and the investments and actions which will be needed to exploit them.

The results of Foresight - drawing on contributions from a wide spectrum of skills and expertise - will inform decisions on spending, particularly by Government but also by industry.

Fore*sight*

First Progress Report

1996

Office of Science and Technology 1996

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THE UK TECHNOLOGY FORESIGHT PROGRAMME: FIRST PROGRESS REPORT
EXECUTIVE SUMMARY

The Technology Foresight Programme completed its first phase in the Spring of 1995 with the publication of 15 Sector panel reports and an overarching report from the Technology Foresight Steering Group. The current (second) phase of the Programme is building on the networks established in Phase 1. Considerable progress has been made over the last 12 months, as detailed in this Report. The main features of progress are:

- **UK Foresight networks are being extended in both the scientific and business communities:**
  - the Foresight Steering Group has been reconstituted. Sector panels have been retained, restructured and charged with dissemination, networking, promoting action on their recommendations and further sectoral analysis (paras 7-20);
  - the work of panels is being complemented by DTI sector divisions and Government regional offices (para 21); and
  - in parallel, professional and industry bodies, learned societies and trade associations are also disseminating and developing Foresight findings through their corporate and individual memberships (paras 22-26).
- **Foresight's market-led view of key technologies, reflecting wide consultation, is influencing priorities within publicly-funded S&T:**
  - Foresight priorities are now being reflected in the directed components of Research Council programmes, in collaborative schemes such as LINK, and in the Science and Technology portfolios of individual Government Departments (paras 27-57).

- **Processes are being developed to improve coordination of the civil and military science and technology portfolios across Government and to identify opportunities for more "dual-use" technology programmes (paras 46-47)**

- **New partnership building between the Science Base and industry has been stimulated by the Foresight Challenge Competition, launched in September 1995 (paras 58-59)**

- **Underlying "infrastructure" issues identified by Foresight are being considered by the appropriate Government departments or agencies, with actions coordinated through a new Whitehall Foresight Group (para 60). Actions currently include:**

  - reviews of funding methods for research in universities by the Higher Education Funding Councils, to adjust these over time to respond to infrastructural issues while maintaining the high quality of basic research (paras 39-41, 64);

  - A programme to fund new equipment in universities to facilitate foresight related projects (para 64);

  - work to evaluate the role of 'technology incubators' by the Enterprise Panel (para 62);

  - work on Intellectual Property Rights by DTI and ESRC (para 63); and

  - work on skill and training issues by DFEE working through the National Council for Industry Training Organisations and the Science, Technology and Mathematics Council (para 65).

- **Foresight findings are being used to help guide and promote international collaboration by the UK on Science, Engineering and Technology (paras 68-71)**

- **OST is developing approaches towards measuring the effectiveness of the Foresight process (paras 71-72)**

CONTENTS

SECTION **PAGE**

EXECUTIVE SUMMARY I

INTRODUCTION 1

TAKING FORESIGHT FORWARD - THE MAIN PLAYERS 2

IMPLEMENTATION PROGRESS 6

EXTENDING AND EMBEDDING THE FORESIGHT PROCESS 7

Using S&T to Increase UK Competitiveness and Quality Of Life 10

- *Action in the Research Councils* 12
- *Higher Education Funding Councils* 14
- *Department of Trade and Industry* 15
- *LINK* 16
- *Defence* 19
- *Other Departments and the Whitehall Foresight Group* 19
- *The Foresight Challenge Competition* 22

Improving the Supporting Infrastructure for Innovation and R&D Investment 23

Developing Global Collaboration 25

EVALUATING FORESIGHT 26

ANNEXES

A.	Foresight Sector Panels and Chairmen
B.	Summary of Panel Activities
C.	Technology Foresight Steering Group
D.	Summary of Activities of Professional and Trade Associations and Learned Bodies
E.	Whitehall Foresight Group Mandate and Membership

THE UK TECHNOLOGY FORESIGHT PROGRAMME: FIRST PROGRESS REPORT

INTRODUCTION

One of the key initiatives announced in “Realising Our Potential” - the 1993 White Paper on Science, Engineering and Technology - was the Technology Foresight Programme. The Programme aims to encourage mutual understanding and collaboration between science and business; to inform decisions about priorities in publicly-funded science, engineering and technology; and to influence business strategies. It does this by bringing together business people and scientists to identify:

a. trends in markets and in science, engineering and technology over the next 10 to 20 years;

b. the opportunities which these trends present for the UK to enhance its economic performance and improve the quality of life of its citizens; and

c. the range of actions needed to ensure the UK can benefit from these opportunities, including, centrally, actions to develop key areas of science and technology.

2. The first phase of the programme, carried out between the publication of the White Paper and May 1995, made this assessment. It was undertaken by 15 sector panels covering most of the UK economy and composed of business and academic representatives. The panels consulted very widely within their respective communities and were guided in their work by a Technology Foresight Steering Group, similarly composed and chaired by the Government’s Chief Scientific Adviser - then Sir William Stewart.

3. Sector reports from each of the panels were published in March and April 1995[1] and an overarching report, looking across all the sectors, was published by the Steering Group on 22 May

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[1] "Progress through Partnership” Volumes 1 to 15; OST 1995. Available from HMSO

1995[2] , alongside the 1995 Forward Look of Government-funded Science, Engineering and Technology and the second Competitiveness White Paper.

4. Foresight is necessarily a continuous activity. The Government's initial response to the Foresight reports, as announced in the 1995 Forward Look, said that the Office of Science and Technology (OST), working with other departments, would continue to lead and support the Programme; that sector panels and the Steering Group would be retained and that the Government would publish a first progress report on the continuation of the programme at the end of 1995.

5. This present report provides a first assessment of how the programme is being taken forward, the goals for the second phase, the achievements so far and a look ahead to the evaluation of the programme.

6. Some of what is reported here inevitably overlaps with the OST's memorandum of evidence to the recent enquiry into Technology Foresight by the House of Commons Select Committee on Science and Technology. The Government is grateful to the Select Committee for its interest in, and support for, the Programme, and will be responding to the Committee's report[3] in due course.

TAKING FORESIGHT FORWARD - THE MAIN PLAYERS

7. Sector panels continue to have a leading role in taking Foresight forward. They have been reconstituted and slightly restructured. The restructuring reflects panels' own wishes in the light of working experience during the first phase of the programme. The IT and Electronics Panel and the Communications Panel have been merged, while the Agriculture, Natural Resources and Environment Panel (ANRE) has been split into two sectoral components with separate panels now for Agriculture and for Natural Resources and the Environment. A new Marine Panel has been formed in response to the wishes of the marine community.

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[2] "Progress Through Partnership - the Report of the Steering Group"; OST 1995. Available from HMSO.

[3] "Technology Foresight" House of Commons Science and Technology Committee First Report, HC 49, 29 Nov 1995

8. Panel remits have been revised to reflect the shift in emphasis in the second phase, their key objectives for the current 12-18 months being;

a. to disseminate panel findings throughout the relevant industry sector;

b. to continue to develop networks between the scientific and business communities on a regional and national basis to discuss and develop panel findings;

c. to promote implementation of findings in part by brokering partnerships between firms and with Research Councils, Government Departments and universities;

d. to monitor progress with Research Councils and Government Departments as appropriate; and

e. to keep panel recommendations under review and assess them in the light of the views of the community.

9. The precise balance of activity between these objectives varies from panel to panel. The new Marine Panel for example will be placing emphasis on item e. using the initial findings from ANRE and other panels as a starting point.

10. Panels continue to receive secretarial and financial support from OST. The present structure and chairmanships are shown in Annex A. Annex B summarises recent Panel activities and forward plans.

11. The Technology Foresight Steering Group has also been reconstituted, under the chairmanship of Sir Robert May, Sir William Stewart's successor as the Government's Chief Scientific Adviser. Through Sir Robert, the Steering Group will continue to advise Ministers on all aspects of the programme including:

- the actions being taken by Government Departments, academia and industry in response to Foresight recommendations;
- the dissemination of Foresight messages;
- the promotion of Foresight networks; and
- the development of the Foresight process and methodology.

12. The present membership of the Steering Group is shown in Annex C.

13. Within the OST, coordination of the programme as a whole and the servicing of panels and the Steering Group is the responsibility of the Technology Foresight Branch. Part of the Transdepartmental Group, the Branch is now wholly dedicated to Technology Foresight (having previously also had responsibilities for the Forward Look) and has slightly increased staff resources.

14. Other key players in Foresight implementation include the Research Councils, DTI sector divisions and Government regional offices, other Government Departments, Higher Education Funding Councils (HEFCs), the learned societies, professional and industry bodies. Their complementary roles in taking Foresight forward are described in the next section and are illustrated in Figure 1.

Foresight Players

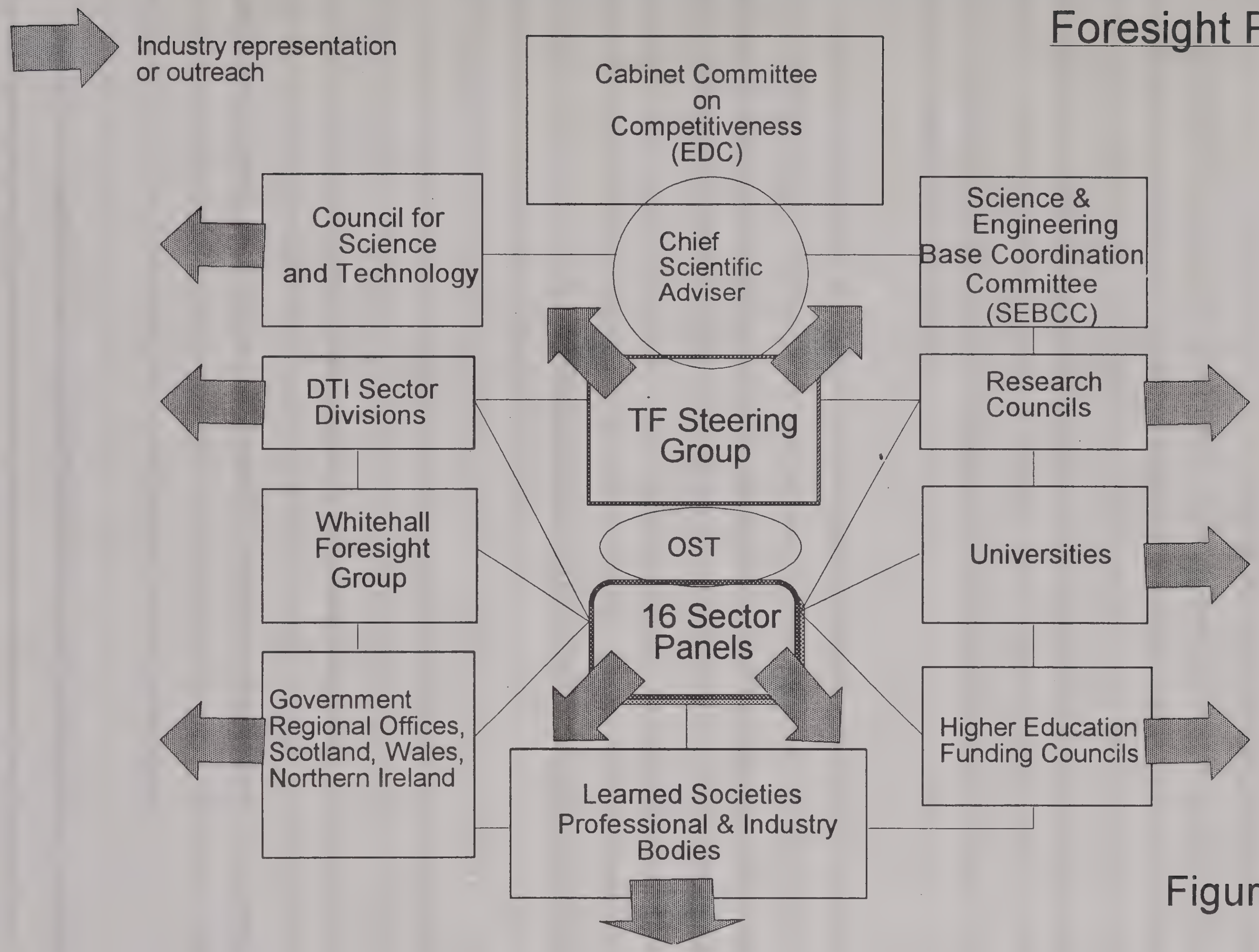

Industry representation or outreach
Cabinet Committee on Competitiveness (EDC)
Council for Science and Technology
Chief Scientific Adviser
Science & Engineering Base Coordination Committee (SEBCC)
DTI Sector Divisions
TF Steering Group
Research Councils
Whitehall Foresight Group
OST
Universities
16 Sector Panels
Government Regional Offices, Scotland, Wales, Northern Ireland
Higher Education Funding Councils
Learned Societies Professional & Industry Bodies

Figure 1.

IMPLEMENTATION PROGRESS

15. Ministers have identified four strategic goals for the second, implementation phase of the Technology Foresight Programme. These are:

a. to extend and embed the Foresight process;

b. to use Science and Technology to increase UK competitiveness;

c. to improve the supporting infrastructure for innovation and R&D investment in the UK; and

d. to develop global collaboration.

16. The goals are being pursued concurrently and were outlined in a speech by Mr Ian Taylor, Minister for Science and Technology to the CBI/AIRTO conference on 23 October 1995. Progress towards each of these goals is described below.

EXTENDING AND EMBEDDING THE FORESIGHT PROCESS

17. The Government is committed to establishing Foresight in the UK as a continuous and market led process. That commitment is being given effect through:

- dissemination and networking activities by the 16 sector panels;
- complementary activity by DTI sector divisions and Government regional offices;
- complementary activity by other Government departments;
- joint working with professional, industry and academic bodies;

- cross sectoral dissemination and networking events; and
- the production and distribution by OST of a Foresight newsletter and diary of events.

18. A substantial Foresight network now exists arising partly from the outreach achieved by panels during Phase I of the programme. At the core, panel membership itself amounts to over 300 people drawn from the academic and business communities. OST maintains a wider list of Foresight contacts numbering some 3,000 and the Foresight Newsletter is now distributed to some 12,000 people every 6 weeks or so. Panels are promoting awareness of findings in their reports and are continuing to build on the sectoral networks already established through regional workshops, press coverage and other forms of dissemination event and mail-outs.

19. Good links have been established between panels, the relevant Research Councils and Government Departments. The Transport Panel, for example, has contact with the Department of Transport and has presented its findings to the Secretary of State. The Construction Panel has made a major input to the "Whole Industry Research Strategy for Construction" which has been developed by the Department of the Environment. Other links help to embed Foresight findings in future initiatives. For example the Chairman of the Financial Services Panel has been appointed to the Council of the ESRC and the former Chairman of the Chemicals Panel now sits on the LINK Board (which is itself chaired by a former member of the Steering Group).

20. Several panels have also taken initiatives to develop cross sectoral links eg Construction and IT, Defence and Aerospace with Materials, Financial Services and Retailing combining in workshops on fraud prevention, and a sub group spanning Agriculture and Food. Cross-sectoral linkages will be extended during 1996 by the Office of Science and Technology through the organisation of a series of workshops embracing several of the generic or cross-sectoral themes emerging from the programme. Some of these events will be planned to coincide with Science Engineering and Technology Week during March 18-22 1996.

21. Through its sector divisions and regional offices, DTI is funding a complementary programme

of initiatives to disseminate and facilitate take-up by industry of the Foresight messages. The Department is providing £2 million during 1995/6 and 1996/7 to support a range of activities, with particular emphasis on encouraging the development of sustainable networks and partnerships between industry and academia. For example, the Government regional offices are organising a series of workshops and seminars, many on specific sectoral themes which are relevant to developing a Foresight strategy for their region. These activities will primarily benefit small and medium sized companies at the local level. DTI's sector divisions are analysing the Foresight reports to identify the issues most relevant to companies of all sizes in their industrial sectors. DTI is encouraging industry to take-up the outputs of Foresight through close dialogue with companies, Trade Associations and other organisations. In all these activities, DTI sector divisions and regional offices are working closely with the Foresight panels, through the OST panel secretaries, to ensure activities are well coordinated and mutually reinforcing.

22. The Centre for Exploitation of Science and Technology (CEST) has also published a report - "Acting on Foresight" - which seeks to show how the findings in Foresight reports can link in with normal business processes within the firm. The CBI and the Association of Independent Research and Technology Organisations (AIRTO) strongly support the Technology Foresight Programme and following their annual conference on 23 October 1995, which was devoted to Foresight implementation, will be working with OST on further plans for dissemination to businesses.

23. Results from the first phase of the programme have also been strongly embraced by the learned societies, professional and industry organisations. The Royal Society of Chemistry, the Institution of Chemical Engineers and the Chemical Industries Association, for example, have established a joint group to take forward the findings from the Chemicals Panel. They are jointly undertaking a programme of workshops and exploring new possibilities for partnerships between the science base and the business sector. The Institute of Physics organised a Foresight conference in May 1995 at which representatives from each panel presented their findings to the physics community. The Institute is continuing its awareness raising activity through a 'SME Club' targeted particularly on small and medium sized firms in the physics based industries. The Institute of Materials is promoting a programme of regional workshops and has developed its own strategic proposals for implementing Foresight. Similarly the

Institution of Electrical Engineers (IEE) will be promoting dissemination through its network 'local centres' during 1996 and the Engineering Employers Federation (EEF) has been working closely with the Manufacturing Panel to help promote awareness of the panels' findings.

24. The Learned Societies have provided important input to Foresight and are in strong positions to communicate Foresight findings to their members and to wider communities. The Royal Society published a report in October 1995 on the first phase of the programme and offering views on its future conduct. The Royal Academy of Engineering ran two events on Foresight during the second half of 1995. It is also establishing the "Engineering Foresight Awards" to promote engineering secondments overseas in fields highlighted by the Foresight Programme. The Royal Society of Edinburgh (RSE) has collaborated with Scottish Enterprise, Scottish Financial Enterprise, The Scottish Office and the OST in organising several Foresight events. The RSE has formed an internal Working Party of Fellows to encourage dissemination and implementation of Foresight themes, priorities and recommendations in the Scottish context.

25. The networks offered by all these bodies through their individual and corporate members are very extensive. The IEE for instance embraces over 130,000 members and the EEF contains some five thousand member firms. They are therefore important potential "multipliers" or "embedders" of the Foresight culture. The Government is grateful for the support already coming from the societies, institutions and associations and looks forward to building on this. Annex D summarises activities to date.

26. Industry is integrated into the Foresight process. Apart from the contribution of senior individuals from companies to the Sector Panels and Steering Group, the events organised by the Panels and the organisations noted above have been well supported by business. In addition, most of the key players involved in Foresight (as shown on Figure 1) either embrace representatives directly or have substantial outreach to companies. Industry has also been attracted into new partnerships with the science base as a result of the Foresight Challenge competition (para 58). Nevertheless, getting the Foresight way of thinking through to individual companies, especially smaller firms and those in sectors which have been traditionally low investors in R&D, remains a challenge for the programme. The

Government hopes that by working with all the various partners noted above, awareness of the Foresight reports and network building will penetrate to more and more businesses. Further consideration is being given to how this process might be best reinforced.

USING S&T TO INCREASE UK COMPETITIVENESS AND QUALITY OF LIFE

27. The goal here is to link the Science Base, Government Departments and industry through joint investments in wealth creating and quality of life programmes in science, engineering and technology. The Steering Group report pointed to 6 priority fields as having long range competitive potential in terms of markets, strong scientific capabilities in the UK and pervasive effects across the economy and society. The fields are:

- harnessing the future power of communication and computing technologies;
- building new products and processes from the expansion of biological and genetic knowledge;
- improving the range, flexibility and quality of materials;
- securing high standards of products and services through sensor and automation technologies, business processing and managements systems;
- securing a cleaner world through the development and application of environmental sciences, and technologies for pollution control, clean processing and clean energy, and product life cycle analysis; and
- applying knowledge of social trends and social factors to the better understanding of markets, risks perception and the human impact of new technology.

28. In his Policy Statement on 20 July, Mr Taylor identified a seventh theme in which these fields for advance come together to provide a focus on quality of life objectives:

- "Extending Quality Life" (EQUAL) through better understanding of the interactions between health, diet and life style, and the development of technologies for healthy ageing, for neighbourhood and individual security, and for improved access to leisure, learning and financial services.

29. These fields are broad and strategic and are not about picking winners in the sense of particular products or single technologies; they embrace wide sectors of business and commerce and many scientific disciplines; they are also broad enough to embrace most of the sector specific initiatives recommended by panels. Many companies have markets within these fields or, through competition, will be affected by developments in them. None of the themes are entirely new - it would be surprising if they were - and components of them are already in place. A continued and concerted drive towards more investment in these fields however will enable the UK to build on its strengths and to influence its competitive future rather than having to react to global competition. Towards this goal, several initiatives have been set in hand.

30. First, there has been "mapping" by Research Councils and Departments of some public sector R&D portfolios against Foresight findings to identify gaps to be taken into account in future plans or the scope for reinforcement of existing programmes. Secondly a number of new LINK programmes have been launched; thirdly new collaborative fora have been established and fourthly the Foresight Challenge Competition has been launched. These initiatives are described below.

Action in the Research Councils

31. The Director General of Research Councils published an initial assessment at the end of June 1995 and since then Research Councils have been refining their "mapping" work and determining future plans.

32. The **Biotechnology and Biological Sciences Research Council** (BBSRC), through its three user-led Directorates, has carried out its own extensive consultation exercise with its user and science base. As a result, BBSRC has identified 14 strategic research programme areas to take forward many of the recommendations of the Steering Group and the four most relevant Panels. These programmes were launched in Summer 1995 with £15m grants awarded in 1995/96. BBSRC has continued to provide support for the highest quality fundamental research and is also addressing infrastructural issues such as the provision of new equipment and facilities, for which BBSRC has awarded £2m over the past year, with matching funds from industry. Other specific activities include: the launch of a new Bioinformatics Research Initiative in which BBSRC will invest £10m over the next four years; the development of two new LINK programmes in Applied Biocatalysis and Analytical Biotechnology; and the launch of a new Technology Foresight Fellowship Scheme to support post-doctoral scientists working on Foresight-related areas. The Council has now formed an independent panel, the membership of which comprises representatives of the Chemicals, ANRE, Food and Drink and the Health and Life Sciences Panels, and the Steering Group, to consider BBSRC's response to date to Foresight and to recommend further actions for BBSRC to pursue.

33. The **Economic and Social Research Council** (ESRC) has carried out a unique national consultation exercise, involving both researchers and research users, to supplement and incorporate the results of Foresight. Nine new thematic priorities have been identified to which more than two thirds of its research and training budget will be devoted. New research centres in innovation, representing £5.6m invested over five years, have been commissioned and will begin operation in 1996. Other important initiatives include a new Resource Centre on Business Processes and major new research programmes on "Cities, Competitiveness and Social Cohesion" and "Socio-Economic Variations in Health".

34. The **Medical Research Council** (MRC) has launched two new LINK programmes which will strengthen academic/industry collaboration in Foresight priority areas: "Integrated Approaches to Healthy Ageing" and "Genetic and Environmental Interactions in Health". Foresight priorities have been incorporated into MRC's strategy for future research and infrastructure, and have reinforced or re-focussed effort in several areas. Further specific plans are being pursued in areas relevant to genetic and biomolecular engineering, integrative biology, health and lifestyle and neurosciences. A second regional technology incubator will open during 1996, and further action is being planned to promote joint working with industry and facilitate start-up ventures. Council has found that, overall, many current programmes match Foresight priorities well: for example, there is already a major commitment to genetics and its application to human health. MRC has also been developing a strong portfolio of research relevant to healthy ageing, being a central element of both the Health and Life Sciences Panel and of EQUAL.

35. In response to Foresight, the **Natural Environment Research Council** (NERC) is participating in four new or enhanced Foresight-aligned LINK programmes concerned with: the better exploitation of oil and gas reservoirs; earth observation; aquaculture; and advanced sensors for ocean applications. New thematic programmes in areas identified by Foresight and its own user survey include environmental diagnostics in cooperation with the chemicals industry (£7m over five years); ecological dynamics and genes (EDGE) which advances knowledge of genetics (£2.5m over five years); and urban regeneration and the environment (URGENT). Planned programmes that are well-advanced include: managing impact on the marine environment (MIME), and protocols and tools for environmental decision-making (DAMSEL). New dialogues have been opened up with the diverse NERC user communities, often on issues that cut across traditional discipline boundaries, such as the public perception of industrial impact on the environment and the risk to industry and commerce from extreme environmental events.

36. The portfolio of research supported by the **Engineering and Physical Sciences Research Council** (EPSRC) already addresses many Foresight recommendations. Foresight will continue to be a key driver in the Council's business planning process, including, for example, the establishment of new LINK programmes biased towards Foresight opportunities. Through its Technical Opportunities Panel

and its User Panel, the Council has identified initial priority areas, such as Sensors and Sensory Systems, Human Factors (the human-computer interface), Optical Technology and Environmentally Sustainable Technology. EPSRC, in collaboration with the DTI, is also developing a new activity to encourage academic/industrial interaction via a pilot scheme of Faraday Partnerships. These would be centred on independent Research and Technology Organisations as intermediate bodies facilitating the involvement of user companies and universities. Detailed Foresight Action Plans have been developed for all areas of EPSRC's programme, forming the basis of "The EPSRC Response to Foresight", published in February 1996.

37. The research programme of the **Particle Physics and Astronomy Research Council** (PPARC) embraces several areas of expertise and advanced technologies relevant to Foresight recommendations such as detector technology, mathematical model building and image processing. PPARC's Industrial Policy Advisory Committee is assessing the scope for enhancing industrial collaboration and technology transfer in the light of Foresight findings, using its own scheme for promoting collaboration, the PPARC Industrial Programme Support Scheme (PIPSS).

38. Similarly the **Council for the Central Laboratories of the Research Councils** (CCLRC) has identified key areas amongst panel recommendations where its institutes can offer significant expertise for collaborative work with industry - in materials, sensor development and high performance computing. In response to the EQUAL initiative, the CCLRC has initiated a study with clinical oncologists of the possible application of its "ISIS" facility to clinical research into the application of proton therapy in the treatment of cancer.

Higher Education Funding Councils

39. The Higher Education Funding Councils and the Department of Education for Northern Ireland (DENI) have also been actively considering the implications of the Foresight reports in relation to their responsibilities for the funding of research in universities and the supply of highly qualified manpower. The **Scottish Higher Education Funding Council**, for example, has recently completed a consultation exercise "Addressing Technology Foresight" setting out various means by which the Council might

respond to Foresight findings. An action plan has been prepared and submitted to the Secretary for State for Scotland in the light of the responses received.

40. The **Higher Education Funding Council for England** will include the desirability of moving funds towards Foresight priorities in its forthcoming review of funding methods and will examine how far collaborative research rewarded through the Generic Research (GR) component of its existing funding formula has moved towards Foresight priorities. The current review of post graduate education being conducted jointly by the Funding Council, the Committee of Vice-Chancellors and Principals (CVCP) and the Standing Conference of Principals (SCOP) has also been asked to consider the manpower related recommendations of the Technology Foresight reports. Progress with these reviews will be reported in the 1996 Forward Look. **DENI** is associated with these initiatives through the Northern Ireland Higher Education Council.

41. The **Higher Education Funding Council for Wales** is already taking account of the Foresight reports in its "proposals based" element of research funding. In December 1995, the Council invited specific proposals for high quality research identified by Technology Foresight and which were important to the economy of Wales. It is considering how other aspects of its research funding should also take account of the Foresight reports.

Department of Trade and Industry

42. DTI has a central role in Foresight implementation, primarily to facilitate industry's own take up of the outputs of the programme and to ensure that companies are fully informed about the implications for their own business strategies. The Department, particularly through its sector divisions, is integrating Foresight messages into its daily business of promoting industrial competitiveness. Many of the Department's innovation activities now have a specific Foresight element. For example, the "Focus Technical which helps Research and Technology Organisations develop their technical services for smaller firms, and the "Managing in the 90s" best practice programme, both have Foresight themes to enable the business sector to see how they can best use Foresight to improve their competitiveness. DTI's overseas technology services, such as the Overseas Science and Technology Expert Missions

Scheme (OSTEMS) are also addressing Foresight issues, for example by having overseas missions on a specific Foresight identified area.

43. DTI has also recently launched a substantial Information Society Initiative (ISI), worth up to £35m of DTI support, to help British business respond effectively to the challenges involved in the move towards the "information society". ISI aims to create an environment for the development of a UK multimedia industry, improve the awareness of UK companies of the benefit of using information and communications technologies and enable UK suppliers to respond to the opportunities. Plans for ISI were discussed with members of the ITEC Panel and the resultant initiative directly addresses a number of the Panel's and the Steering Group's recommendations.

LINK

44. LINK is the Government's principal mechanism for supporting collaborative research in partnership between the public and private sectors. Since March 1995, various Departments and Research Councils have announced a total of ten new LINK programmes, as listed in Table 1 below. These programmes, which respond to key priorities identified by Foresight reports, will support innovative research projects involving companies and universities. The value of projects within these programmes is expected to total some £70m. In addition, extra funding has been injected into four existing LINK programmes in recognition of Foresight priorities identified in those areas. These are shown in Table 2 below.

45. Departments and Research Councils will continue to develop new LINK programmes that respond to the Foresight priorities, in conjunction with industry and academia. The LINK Board, chaired by Dr David Smith, until recently a member of the Technology Foresight Steering Group, maintains a strategic overview of the LINK portfolio and its contribution to advancing Foresight.

Table 1

NEW LINK PROGRAMMES IN RESPONSE TO FORESIGHT

Programme	Announced	Sponsors	Description
Applied Biocatalysis	March 1995	BBSRC/DTI	The programme aims to maintain and extend UK competitiveness in biocatalysis technology and to facilitate the broader application of biocatalysis in UK industry. It supports research to improve both the understanding and the usability of biocatalytic processes.
Waste Minimisation through Recycling, Re-use and Recovery in Industry	May 1995	EPSRC/DTI	The programme aims to develop and implement cost effective technologies for recycling, re-use and recovery of materials within the manufacturing and process industries, thereby reducing waste and input and disposal costs.
Integrated Approaches to Healthy Ageing	August 1995	MRC	The programme aims to improve understanding of molecular, cellular, psychological, physiological, immunological and social factors affecting good or ill health in old age. It also aims to develop new ways of supporting healthy ageing and independent living, and to develop new approaches to the prevention, management and rehabilitation of disorders affecting the elderly.
Genetic and Environmental interactions in Health	August 1995	MRC	The programme aims to identify key genetic, environmental and other risk factors that lead to the major multi-functional diseases, and to identify genetic factors that affect susceptibility to drugs and environmental toxins.
Earth Observation	August 1995	BNSC/DTI/NERC/DoE	The programme aims to support innovative pre-competitive earth observation applications research on a collaborative basis targeted on end user needs emerging from Foresight.
Aquaculture	December 95	MAFF/NERC/SOAEFD	The programme aims to accelerate the commercial development of aquaculture in the UK. Research themes are investigation of new species, developing species, established species, disease, fish processing, economics and the market, demonstration projects and environmental impact.
Analytical Biotechnology	December 95	BBSRC/DTI	The programme aims to facilitate the application of analytical biotechnology across a broad range of UK industry sectors, and to promote the development of new methodologies and techniques to advance its commercial application.
Horticulture	December 95	MAFF/BBSRC/DoE/ DANI/SOAEFD	The programme aims to underpin the competitiveness and responsiveness of the horticulture industry, focus on the industry's ability to respond to the needs of the market-place, and improve the industry's ability to expand into new markets.
Inland Surface Transport	January 1996	DoT/EPSRC/ESRC/DTI	The programme aims to support collaborative research that will lead to efficient, safe, socially- and environmentally-acceptable inland surface transport systems. Themes to be addressed are: improving understanding of transport systems; specific transport mode technologies; and generic issues in transport.
Advanced Sensors for Ocean Applications	March 1996	NERC	The programme encourages collaborative research on advanced sensors for ocean applications, including optical sensors for the marine environment, sensors based on fibre optic technology, solid state chemical sensors, robust and reliable sensors and sensor platforms.

Table 2

ENHANCEMENTS TO EXISTING LINK PROGRAMMES IN RESPONSE TO FORESIGHT

Programme	Enhancement Announced	Sponsors	Description
Hydrocarbon Reservoirs	June 1995	DTI/NERC	Additional funds are being allocated to research directed at more accurate identification and assessment of new oil and gas fields; and technological improvements to increase yields from existing oil and gas fields.
Surface Engineering	July 1995	EPSRC/DTI	The programme supports collaborative research into new and improved surface treatment and coating systems and their associated process technologies. Additional funds are being allocated to new projects that address relevant Foresight priorities.
MedLINK	December 95	DH/EPSRC/MRC	The programme aims to stimulate the development and uptake of advanced technologies by the medical devices industry in areas of clinical priority. It will have three broad themes- diagnostics, therapeutics and rehabilitation.
Agro Food Quality	October 95	MAFF/DTI/BBSRC	The programme encourages collaborative research to provide the foundations for improved food quality and, in particular, stimulates research leading to improvements in the consistency of food raw materials and awareness of factors relating to nutrition and food acceptability.

Defence

46. The OST/DTI has also been working with the Ministry of Defence to identify key Foresight technologies that will be of joint interest to the defence and civil sectors. Processes are being developed with MoD by which military and civil S&T portfolios may be better coordinated across government departments. In parallel, mechanisms are being constructed to foster further civil and defence S&T collaboration so that new dual-use programmes can be brought forward in Foresight related areas. A report to Ministers is expected in early 1996 for possible implementation at the start of the next financial year.

47. MoD has also embarked on the re-appraisal of its technology strategy. Developing many of the themes raised by the Foresight reports, the Department has sought to include industry within the consultation process. The strategy will be completed by mid 1996.

Other Departments and the Whitehall Foresight Group

48. Other departments are also actively involved in Foresight implementation. Action managers have been designated in 15 departments to assess and take forward Foresight findings in relation to their own departments responsibilities and S&T programmes. Their work is being coordinated through a Whitehall Foresight Group chaired by OST. The remit and membership of the Group is given in Annex E. Some examples of the Group's evolving work on S&T initiatives are noted below, while those in relation to the "infrastructure" recommendations of Technology Foresight are described in the next section of this report.

49. **The Department of Health** is mapping the recommendations of the Health and Life Sciences Panel on to its own R&D portfolio. This work will be taken into account by the Department's R&D forum recently established to bring together industry, MRC, EPSRC, BBSRC ESRC and the medical charities.

50. **The Health and Safety Executive** is assessing the implications of Foresight for its own work in fields such as genetics and biomolecular engineering, software and sensors for safety control applications, modelling and prediction of complex systems, risk assessment and management. In January 1996, HSE published a report on behalf of the Interdepartmental Liaison Group on Risk Assessment (ILGRA), which reviews the principles and practices of risk assessment within Government.

51. **The Department of the Environment** is continuing to support the whole industry research strategy for construction, which is helping to implement findings from the Construction Panel. Through the DOE-led Energy Efficiency Best Practice Programme and, in partnership with the DTI, the Environmental Technology Best Practice Programme, the Department is addressing themes from the ANRE and Energy Panel reports. In many areas, DOE has already identified issues that have been raised by the Foresight Panels and the Steering Group and is acting upon them as far as possible within its published research objectives. A new development is the Department's support, on a project-by-project basis, for research within new LINK programmes launched in 1995. This marks the first DOE involvement in LINK outside the construction sector.

52. The **Department of Transport** is taking the recommendations from Foresight fully into account in its research planning. In January 1996 a new Inland Surface Transport LINK programme was announced, jointly sponsored by DOT, EPSRC, ESRC and DTI. The sponsors are seeking proposals which reflect the Transport Panel's priorities in a number of areas including: interfaces between transport modes; transport telematics; safety improvement and enforcement; and urban traffic control. Further cross-sectoral research is being considered. The Department is continuing to explore how it can best support the projects identified by the Transport Panel, particularly the "Informed Traveller" and the "Clear Zones" projects.

53. Much of the existing **MAFF** science and technology programme maps on to Foresight recommendations. In particular several LINK programmes involve collaboration between the department, industry and the science base eg advanced and hygienic food manufacturing and sustainable farming systems. The Department is also participating in the new LINK programme for aquaculture.

54. **The Department of National Heritage** is working with DTI and the National Film and Television School, on the feasibility of setting up a creative media technology centre (one of the recommendations of the Leisure and Learning Foresight panel) and is also considering other initiatives to link national heritage assets into IT and multimedia technologies.

55. The **Scottish Office** is developing plans for Foresight implementation in Scotland within the UK context. The Scottish Office Education and Industry Department (SOEID) has issued a consultation paper to the academic and the business communities in Scotland about the best ways of advancing the programme. It will take forward issues raised in responses with the key representative bodies in order to foster collaborative activity on the Scottish dimension to Foresight. The Department will also be organising, with others, a series of cross sectoral dissemination events in Scotland during 1996. The Scottish Office Agriculture, Environment and Fisheries Department has been considering how Foresight might best be taken forward in the context of its grant-in-aid funding, eg biological science in Scotland. The Scottish Office Department of Health (SODoH) is considering sponsorship for MedLINK in 1996/97. Also, the Royal Society of Edinburgh Research Fellowships which The Scottish Office funds (at around £200,000 p.a.) will from 1996-97 include relevance to Foresight in the selection criteria.

56. In **Northern Ireland, the Industrial Research and Technology Unit (IRTU)** has also organised dissemination events and has radically revised its existing S&T programme. The new programme entitled “START” was launched in September 1995 and has been redesigned to embrace Foresight priorities or other initiatives that will be complementary to Foresight. In addition, IRTU, in conjunction with the CBI(Northern Ireland) “Growth Challenge”, is developing plans for identifying Foresight priorities for Northern Ireland within the UK context. It is due to report by the end of 1996.

57. The **Welsh Office Industry and Training Department** will be organising a series of dissemination events, initially addressing the sectors which most closely reflect the main industrial focus in Wales. Increasingly, however, this will be extended to include the relevant messages contained in all the Panel reports. Working with the Welsh Office and companies in the relevant industrial sectors, the Welsh Development Agency has established technology fora in the medical opto-electronic, pest management and materials sectors. More are planned.

The Foresight Challenge Competition

58. The Foresight Challenge Competition is a major cross-sectoral initiative, first announced in the Second Competitiveness White Paper and the 1995 Forward Look. The Challenge was launched by OST on 25 September 1995. It is intended to give a boost to partnership building between the science base and industry on Foresight priority topics and it offers funds to attract bids for collaborative projects with matching contributions from industry.

59. The response to the call for proposals for the first round of the competition has been outstanding. Over 500 outline bids were received from consortia involving a wide range of companies, public sector bodies and universities. Of these, 64 have recently been invited to submit full bids. The invited consortia alone encompass over 270 bids from large industrial partners, over 170 bids from universities and higher education institutions (HEI), 58 bids from public sector bodies, 3 bids from trade associations and 2 from charities. Further, around half of the 64 bidding consortia have identified small and medium sized partners, totalling nearly 50 such firms in all. The winning consortia will be announced towards the end of May.

IMPROVING THE SUPPORTING INFRASTRUCTURE FOR INNOVATION AND R&D INVESTMENT

60. To make the most of future advances in science, engineering and technology, the Steering Group report made clear that there also needed to be a supporting "infrastructure" in terms of excellence in basic research, supply of skilled people, an encouraging financial "climate" for innovation and appropriate regulation and arrangements for intellectual property rights. The agenda here is largely one for Government, coordinated by the Whitehall Foresight Group. Examples of relevant initiatives that have been set in motion are given below.

61. **HM Treasury, DTI and the Bank of England** have pursued various initiatives focusing directly on the financing of smaller businesses over the past two to three years. The Treasury has completed a study, under the Industrial Finance Initiative, of the impact of the fiscal and regulatory regime on the flow of finance from savers through to industry. This was followed by the introduction of Venture Capital Trusts and the Enterprise Investment Scheme to improve the flow of finance to small firms. Changes have been made in successive Budgets to the capital gains tax regime to encourage investment in the smaller company sector, while the DTI has reviewed the Loan Guarantee Scheme. The Bank of England's initiative of involving banks, small firm representative groups, Government and academia to consider finance for small firms has continued, with a third report published in January 1996. The CBI and representatives of the small business sector have been active participants in the process.

62. In addition, **the Enterprise Panel**, established by the Treasury, is assessing whether there is potential for encouraging the concept of "business incubators" in the UK (a recommendation of both the ITEC and the Health and Life Sciences Panels as well as the Steering Group), in the light of experience in the US and elsewhere. The Enterprise Panel will be reporting in July 1996.

63. **DTI** is jointly sponsoring, along with **ESRC** and the Intellectual Property Institute, a research programme in Intellectual Property Rights (IPR), aimed at improving understanding, both in Government and among firms, of the relationship between IPR and wealth creation/competitiveness.

Eleven projects have been funded to date and research commenced in October 1995.

64. The **Higher Education Funding Council /DENI** reviews already described will address research organisation issues such as the maintenance of high quality basic research, and the need to respond to and promote inter-, multi- and cross-disciplinary research and collaboration between university departments and with users of research. In addition, HEFCE, SHEFC and DENI, with OST and the Research Councils, are mounting an initiative to fund equipment in areas of high quality research. The programme will be open to institutions which can match the funds they secure from the Council with industrial or other user funding.

65. The **DFEE**, working through the National Council of Industry Training Organisations and the Science, Technology and Mathematics Council, has been actively assessing the Technology Foresight reports for their implications in relation to vocational education and training. A report, "Technology Foresight: Nurturing the UK Skills Base" was recently published by the two Councils (December 1995) and this is now forming the basis for developing practical action proposals. In a wider educational context the department is actively pursuing initiatives to improve the skills base and the application and understanding of new communication technologies in education.

66. **The Welsh Office** will use the Foresight recommendations to inform the preparation of the EC Regional Technology Plan for Wales. The Plan will aim to reflect consensus among private and public bodies on the objectives and actions required to upgrade the technological base, skills content, innovative capacity and value-added performance of Welsh industry. Recommendations will be made to guide decisions on innovation support frameworks and financial initiatives in Wales over the medium to long term.

67. **The Research Councils**, in addition to the targeted programmes described earlier, are giving active attention to their responsibility for the support of high quality basic research and research training and the promotion of public understanding of science, to underpin the future knowledge and skills base of the country for the benefit of all sectors.

DEVELOPING GLOBAL COLLABORATION

68. Although the UK more than pulls its weight as a scientific nation, funding about 5% of the world's science, engineering and technology, this still means that 95% of science, engineering and technology advancement takes place elsewhere. A vital source of UK competitiveness must come therefore from securing access to global advances and developments through international collaboration and international "science watch" activities.

69. The UK already collaborates actively and successfully with its European partners in the EU R&D Framework Programme. The consultation paper on the Fifth Framework Programme which has just been issued also draws attention to the need to take Foresight findings into account.

70. Bilateral discussions are also being planned with EU member states to discuss the priorities emerging from national Foresight exercises and the scope for bilateral or multilateral collaboration in R&D programmes. The UK gave a presentation to the the Organisation for Economic Cooperation and Development (OECD) in September1994, to the European Scientific and Technical Research Committee (CREST) in July 1995 and a further presentation was given at the National Institute for Science and Technology Policy (NISTEP) International Conference on Technology Forecasting in Japan in June 1995. Considerable international interest has been expressed in the UK Technology Foresight Programme and this should help pave the way for future global collaborations.

71. One task of the Foreign and Commonwealth Office posts overseas is to keep abreast of developments in science, engineering and technology (SET) in their host countries and to report back to the UK. A Consultative Group drawing on representatives from FCO, OST, DTI, the British Council, business, Parliamentary and academic bodies is considering how to improve the dissemination of overseas SET information within the UK, possibly using the CBI, Business Links, the CVCP and the learned societies as umbrella organisations.

EVALUATING FORESIGHT

72. While the main emphasis of current work is to take Foresight forward through dissemination, networking and partnership building, there is a need to evaluate the programme both as a process and for what it achieves. At this point it is probably premature for OST to devote major resources to evaluating a programme that has been running for only 2 years and which is now moving from an analytical stage into an implementation one. Nonetheless, before the memories of participants fade, a small scale study of the first phase has been initiated by OST. This centres on a survey of the 300 or so members of panels whose opinions has been asked about various aspects of the phase I process. This survey is being conducted by PREST at Manchester University. A larger scale survey may be appropriate at the end 1996/97 when opinion can be canvassed about both phase I and phase II of the programme.

73. OST is considering the development of other measures of performance as the programme proceeds. Final output measures such as improvements to UK competitiveness and quality of life are necessarily long term and will be difficult to isolate from other influential factors. However, performance information can be assembled to provide "intermediate" output measures and a possible conceptual framework for performance measurement in the programme is shown on Figure 2. OST continues to work on the issues of intermediate and final output measurement.

COMMENTS

74. A continuing objective of the Technology Foresight Programme is to secure outreach and a wide degree of participation. Comments on this interim report would therefore be welcomed and should be addressed to:

Martin Sheppard, Office of Science and Technology, Department of Trade and Industry, Albany House,
94-98 Petty France, London SW1H 9ST

FORESIGHT EVALUATION FRAMEWORK

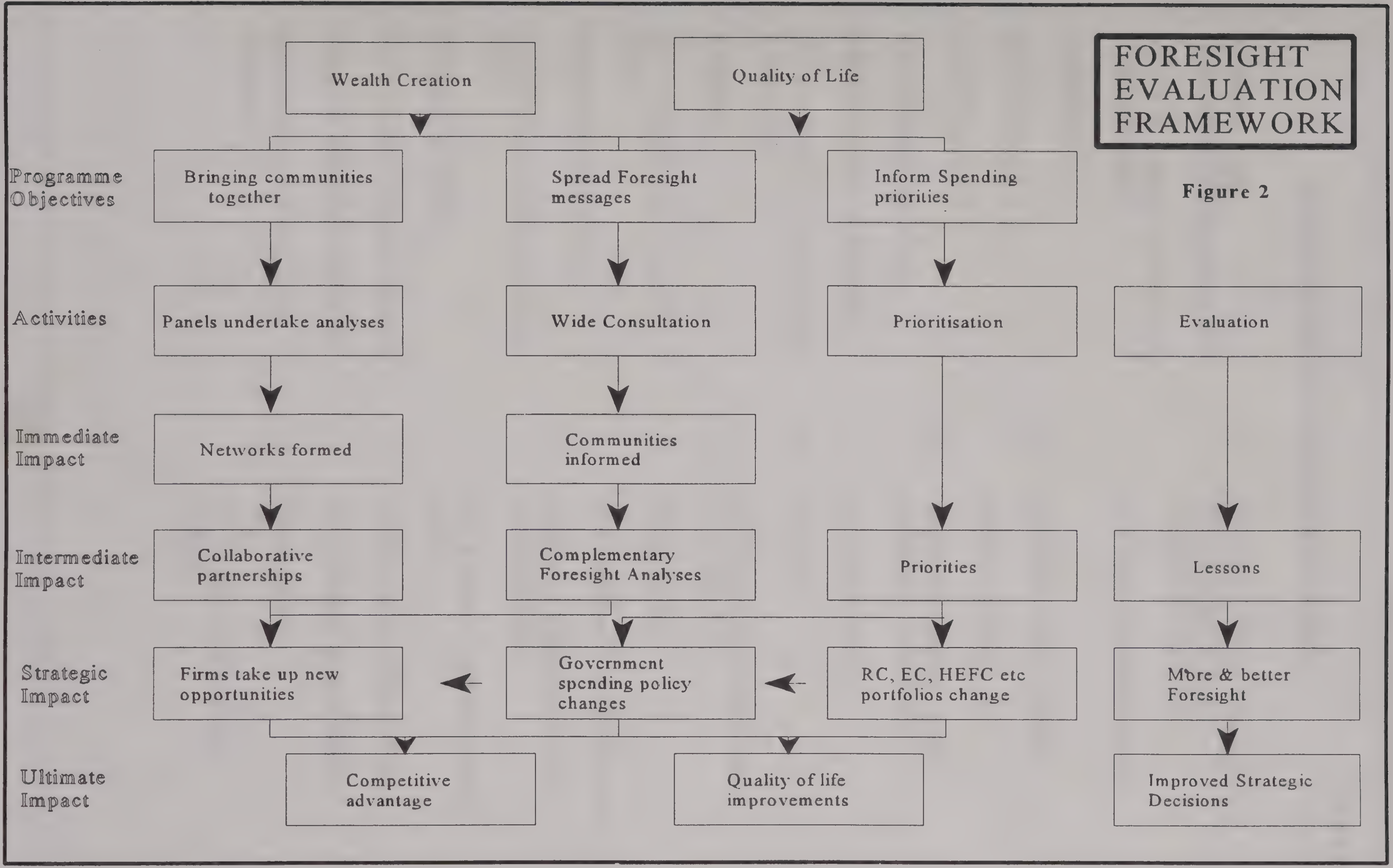

Wealth Creation
Quality of Life
Programme Objectives
Bringing communities together
Spread Foresight messages
Inform Spending priorities
Activities
Panels undertake analyses
Wide Consultation
Prioritisation
Evaluation
Immediate Impact
Networks formed
Communities informed
Intermediate Impact
Collaborative partnerships
Complementary Foresight Analyses
Priorities
Lessons
Strategic Impact
Firms take up new opportunities
Government spending policy changes
RC, EC, HEFC etc portfolios change
More & better Foresight
Ultimate Impact
Competitive advantage
Quality of life improvements
Improved Strategic Decisions

Figure 2

ANNEX A

FORESIGHT SECTOR PANELS AND CHAIRMEN

1. AGRICULTURE, HORTICULTURE & FORESTRY

   Prof J R Hillman, Scottish Crop Research Institute

2. CHEMICALS

   Dr J Beacham, ICI plc

3. CONSTRUCTION

   Mr H Nahapiet, UKDS Ltd

4. DEFENCE AND AEROSPACE

   Mr L A Edwards, Messier-Dowty International

5. ENERGY

   Dr G MacKerron, University of Sussex

6. FINANCIAL SERVICES

   Mr M Hughes, Barclays de Zoete Wedd

7. FOOD AND DRINK

   Prof P J Lillford, Unilever Research

8. HEALTH AND LIFE SCIENCES

   Prof M Ferguson, University of Manchester

9. INFORMATION TECHNOLOGY, ELECTRONICS AND COMMUNICATIONS

   Dr J Taylor, Hewlett-Packard

10. LEISURE AND LEARNING

    Mr P Wallis, SRU Ltd

11. MANUFACTURING AND BUSINESS PROCESSES

    Dr D Grant, GEC plc

12. MARINE

    Mr D Goodrich, British Maritime Technology Ltd

13. MATERIALS

    Dr J Campbell, Cookson Group plc

14. NATURAL RESOURCES AND ENVIRONMENT

    Prof K Turner, University of East Anglia

15. RETAIL AND DISTRIBUTION

    Mr G Winfield, Booker Tate Ltd

16. TRANSPORT

    Mr S Gibbs, Docklands Light Railway

ANNEX B

SUMMARY OF PANEL ACTIVITIES AND PLANS

CHEMICALS PANEL

Chairman: Dr J Beacham, ICI plc

PROGRESS

- The Panel worked successfully to reach a general industry and academic consensus on the need for a national Institute for Applied Catalysis.

- The Panel's recommendations concerning applied catalysis, colloid science and stereo-selective processes are being considered in terms of new LINK programmes.

- A number of dissemination activities have been arranged, including presentations to business and industry and a series of regional workshops. Workshops have been held in Manchester and Northern Ireland and are planned for Scotland, the North East and the Midlands.

FUTURE PLANS

- The Panel plans to encourage initiatives and networks to promote the competitiveness of the Chemicals sector, such as contributing to relevant cross-sectoral workshops.

- The Panel will continue to work to strengthen the underlying infrastructure of the sector by reviewing its key findings and encouraging a greater take-up of its recommendations in SMEs and in higher education.

- The Panel will also encourage other companies and organisations to undertake their own Foresight programmes in order to extend and embed the process.

DEFENCE AND AEROSPACE PANEL

Chairman: Mr L A Edwards, Messier-Dowty International

PROGRESS

- The Aerospace Partnership Foresight Forum was organised in October 1995 by the Panel at which over 100 leading aerospace academics and industrialists were able to discuss the research requirements and capabilities of the UK.

- The Panel has also established sound links with Professional and Trade Associations, such as the Society of British Aerospace Companies and the Royal Aeronautical Society.

- It has set up a number of sub-groups which will address the following matters: industry issues, defence issues, HEFCs, and research and technology. A group on space is planned.

FUTURE PLANS

- The Panel is planning to launch a series of "expansion studies" to further develop the key technical priorities identified in the original report. These will be led by the professional institutions in partnership with other bodies and organisations.

- Major initiatives include developing technology demonstrator programmes, addressing skills issues and examining defence policy-related matters.

CONSTRUCTION PANEL

Chairman: Mr H Nahapiet, UKDS Ltd

PROGRESS

- The Panel developed its framework for addressing dissemination and implementation at a two day workshop in September 1995, aimed at getting the message right and developing an overall strategic plan to transfer implementation of Panel recommendations to bodies with the appropriate expertise and resources.
- Information and communication technology issues are being actively pursued by CRISP, the Construction Research and Innovation Strategy Panel
- DoE is funding a study into creating a competitive infrastructure in construction, for which EPSRC is considering providing further support
- The introduction of an innovation culture is being progressed by the Panel with CRISP, through workshops
- Financial and fiscal changes are being addressed through a CRISP sub-group chaired by the Chairman which will report later in the year

FUTURE PLANS

- A revised leaflet will be published in Spring with a more focused message, with a further progress report to be widely communicated to the industry
- The remaining five recommendations on customised solutions for construction from standardisation, education, business processes in construction, constructing for life and environmental and social audits are being actively progressed for implementation by the end of the year.

ENERGY PANEL

Chairman: Dr G MacKerron, SPRU, University of Sussex

PROGRESS

- The Panel has promoted work on photovoltaic power generation which has led EPSRC to launch a £1m research programme into photovoltaics.
- The Hydrocarbon Reservoirs Technology LINK programme was awarded an additional

£1.8m to meet Panel recommendations

FUTURE PLANS

- The Panel will produce brochures for each of its priority technologies which identify the key messages and actions required to implement its recommendations.

- A workshop is planned for SET 96 Week on clean coal power generation and combined cycle gas turbine technology, seeking a consensus from industry and academia on long term R&D requirements.

- The Panel aims to produce a poster to be circulated to industry and academia summarising the Panel's recommendations.

MANUFACTURING AND BUSINESS PROCESSES PANEL

Chairman: Dr D Grant, GEC plc

PROGRESS

- The Panel has been actively promoting its findings through presentations to companies and trade associations involved in manufacturing. It is working closely with the Engineering Employers' Federation to organise specialised regional workshops which will concentrate on developing the business processes recommended in the Panel report.

- Both the Chairman and Vice-chairman of the Panel are closely involved with the BAAS project "Visions for the Future" which seeks to encourage young people to develop new ideas for the harnessing of science and technology. The project is aligned with many of the recommendations.

- The Panel has identified the Teaching Company Scheme as a key means of advancing its recommendations and have had discussions with the Teaching Company Directorate. The Panel is also working closely with the IMI programme.

- A major seminar was organised in conjunction with the IMechE at Coventry University on Business Process Re-engineering.

FUTURE PLANS

- Plans are being laid to organise a series of seminars in association with the trade association METCOM, whilst the Panel intends to work closely with the IEE to disseminate its findings.

- The Panel will be forming three sub-groups which will develop action plans on Machinery, Processing and Electrical systems. Business Processes will be addressed by the complete Panel.

MATERIALS PANEL

Chairman: Dr J Campbell, Cookson Group plc

PROGRESS

- The Panel is being assisted by the Institute of Materials (IoM) and the Institute of Mechanical Engineers in the organisation of seminars and workshops for dissemination and implementation. In addition, the IoM has undertaken complementary Foresight analysis on particular sectors e.g. aerospace structural materials

FUTURE PLANS

- A series of national and regional "supply chain workshops" is planned to disseminate the findings to industry in cooperation with other Foresight Panels and organisations.

- A national event is to be held in September 1996 at the National Exhibition Centre, where universities will demonstrate their materials research capability to a wide range of industrial companies.

- Seminars are planned on specific recommendations in the report e.g. biomaterials, whilst many speaking engagements are being carried out by Panel members to disseminate Foresight.

HEALTH AND LIFE SCIENCES

Chairman: Prof M Ferguson, University of Manchester

PROGRESS

- The Panel has devised its strategy for carrying forward its work which recognises the need to work with both other Foresight Panels and also other external bodies including the Department of Health and the DTI.

- The Panel has disseminated its findings to a wide range of industrial and research organisations, whilst a number of Professional and Trade Associations are participating in disseminating the Panel report, including the Royal Society of Medicine, the Association of British Pharmaceutical Industry and the BioIndustries Association.

- The MRC is developing its Foresight implementation strategy based on two new LINK proposals. BBSRC and EPSRC are jointly funding a bioinformatics research programme and ESRC has launched a programme investigating health and ageing.

FUTURE PLANS

- Discussions are on-going with the Association of Medical Research Charities to act on recommendations concerning medical research charity funding of overhead costs.

- Plans are in progress for two major seminars on specific topics, one on biotechnology (in

February 1996) and one on integrative biology.

- The Institute of Biology is collaborating with OST on a series of seminars during 1996 taking forward a number of biological recommendations.

AGRICULTURE, HORTICULTURE & FORESTRY PANEL

Chairman: Prof J R Hillman, Scottish Crop Research Institute

PROGRESS

- The membership for this new Panel has been drawn from the previous Agriculture, Natural Resources and Environment Panel. Sub-groups have been established which address Forestry and Wood Products, Livestock Systems and Plant Systems.

- A large number of presentations and workshops have been undertaken by the Panel to disseminate its findings to industry groups, professional bodies and academia.

FUTURE PLANS

- The Panel will produce an updated report focussing on issues in its three major sectors.

- All the sub-groups will organise regional events through which the Foresight findings will be developed further.

- The Panel will focus on improving the networking in the sector by the provision of a readily accessible database of names and contact details of agricultural industries (particularly SMEs) and research organisations. The Panel is investigating ways to make this accessible via the World Wide Web.

FOOD AND DRINK PANEL

Chairman: Prof P J Lillford, Unilever Research

PROGRESS

- The Panel has established two sub-groups to address the recommendations in more detail with respect to Alcoholic Beverages and Meat.

- Members of the Panel have made a large number of presentations to a wide range of organisations, including trade associations, professional bodies, academia and government departments. The Panel has also been involved in the IChemE's "The Challenge of Foresight" conference, the CBI Foresight Conference and the Food and Drink Chief Executive Seminar.

- The recent MAFF Strategy Forum demonstrated that Foresight has pervaded the thinking of all relevant MAFF departments and was enabling better co-ordination of research between MAFF, BBSRC, other government departments and other research councils.

FUTURE PLANS

- The Panel plans to continue its work of disseminating its findings across the industry, seeking to engage major companies in helping to further its activities. Further sub-groups will be established with the help of trade associations and learned bodies.

- It plans to make recommendations on improving the existing mechanisms for technology transfer in the sector, particularly with respect to SMEs.

- The Panel will also seek to improve public understanding of science in the food and drink sector, complementing existing activities by public sector sponsors and others.

INFORMATION TECHNOLOGY, ELECTRONICS AND COMMUNICATIONS PANEL

Chairman: Dr J Taylor, Hewlett-Packard Laboratories

PROGRESS

- The former IT / Electronics and Communications panels have now merged to form a new ITEC panel. The panels' findings have been reported and discussed at industry events, and at open regional workshops in Glasgow, Middlesborough, Leeds, Manchester, Cambridge, London, Guildford and Bristol. Feedback has strongly supported the panels' views, and members have therefore agreed that the next phase of Foresight work should focus on implementing the recommendations made in the two reports.

- The panel has agreed that much of the work will be done through sub-groups. Technology sub-groups are working on the Information Superhighway, Microelectronics, Creative Media, Core Research, Virtual Reality, Infobusiness (with health and life sciences), Displays, Distributed Information Management, Communications Technologies and High Performance Computing. These will work to achieve sufficient independent momentum for the work to go forward autonomously. Process sub-groups are looking at Regulatory Issues, Business Incubators, Presentation and PR, and forming an Industry Round Table. These will develop an achievement strategy in partnership with the relevant stakeholders. Two more groups, in Virtual Centres of Excellence and Education and Training, will have a dual technology and process remit.

- The panel has established WWW pages at *http//www.dcs.ed.ac.uk/foresight/*. These will be updated with information about our activities.

FUTURE PLANS

- The panel intends to commission industry demographics research to establish industry requirements for the next decade. This will include an assessment of education and training requirements. The panel will be asking for major industry support for this initiative, and will link it to the creation of a Chief Executive level ITEC Round Table.

- Sub-groups will continue to encourage, broker and support proposals which will deliver the panel's recommendations.

MARINE PANEL

Chairman: Mr D Goodrich, British Maritime Technology Ltd

PROGRESS

- The membership of this entirely new Panel has been finalised. Its remit is to address the whole range of marine technologies, including environment, marine structures and ships. The Panel first met on 17 January.

FUTURE PLANS

- The Panel intends to carry out its own Foresight analysis, whilst drawing on the relevant recommendations from other Panel reports.

FINANCIAL SERVICES PANEL

Chairman: Mr M Hughes, Barclays de Zoete Wedd

PROGRESS

- The Panel's findings have generated high profile media coverage on a number of occasions.
- The Panel has formed working groups to address each of its four recommendations. The Panel has run six workshops, some in collaboration with Research Councils, to disseminate its findings and promote implementation of its recommendations. Further workshops are planned.

FUTURE PLANS

- The Panel is working with the MoD/DTI/OST Forum on civil and defence issues to promote the use of technology for combatting financial fraud.
- The Panel is in discussion with financial institutions, researchers and funding agencies to promote new initiatives in financial engineering.
- The Panel Chairman is arranging meetings between financial analysts and scientists from various Foresight sectors to raise mutual awareness, promote better communication and explore the business potential of panel recommendations.

LEISURE AND LEARNING PANEL

Chairman: Mr P Wallis, SRU Ltd

PROGRESS

- The Panel has formed three sub-groups to focus more closely on Learning, Electronic Leisure and Non-electronic Leisure. Each of the groups has been charged with developing its action plans by the end of 1995.
- The dissemination process has centred on personal approaches to key opinion formers in the target sectors, including hosting a meeting at the Edinburgh International Film Festival
- A joint meeting has been held the Financial Services, IT and Retail and Distribution Panels on Fraud Prevention.

FUTURE PLANS

- The Panel plans to be closely involved in the DTI's Information Society Initiative, ESRC's Knowledge and Skill programme and EPSRC's Information Technology and Computer Science Programme.
- A major dissemination event to the top 100 UK companies is planned for early 1996.
- Four workshops are being considered on: "management skills for the convergent age", "opportunities for talent hatcheries", "learning software".

RETAIL AND DISTRIBUTION PANEL

Chairman: Mr G Winfield, Booker Tate Ltd

PROGRESS

- The Panel has identified three priority areas: intelligent tagging, land use and fraud.
- On fraud, the Panel has worked closely with the Financial Services Panel including organising two workshops. A further workshop is planned. The Panel has also organised a workshop on "smart cards" and "integrated product intelligence".
- Panel members have been actively disseminating the Panel's findings to individual companies and at conferences and seminars. The CBI has organised two dissemination workshops for its small company members around Panel recommendations.

FUTURE PLANS

- The Panel will organise sub-groups to address intelligent tagging, land use and remote/global retailing. The groups would aim to develop clear deliverable messages to stimulate the industry, as well as specific plans for implementation.
- The Panel is seeking to widen the participation of industry and the Research Council in the work of the Panel by inviting further representatives to join the Panel itself.

TRANSPORT PANEL

Chairman: Mr S Gibbs, Docklands Light Railway

PROGRESS

- The work of the Panel is being carried forward through three sub-groups, which are charged with the dissemination and implementation of the Panel's projects which are "Clear Zones", "The Informed Traveller" and "The Foresight Vehicle".
- The Panel has organised a number presentations and seminars to professional associations and academia. Most notably, the Panel has met with the Secretary of State for Transport.
- DTI has taken up "The Foresight Vehicle" project and has established a programme framework to involve industry and academia. In addition, three UK cities have incorporated the "Clear Zones" projects within their transport strategies, whilst many other cities are keen to take up the proposals.

FUTURE PLANS

- The Vice-Chairman of the Panel is to meet with Neil Kinnock, EU Commissioner for Transport, in order to discuss the Panel findings.
- The Earth Centre, recently announced as a £50 million Millennium Fund winner, is to feature Foresight Transport themes among its environmentally sustainable technologies.

NATURAL RESOURCES AND ENVIRONMENT PANEL

Chairman: Prof K Turner, University of East Anglia

PROGRESS

- This is a new Panel drawn from the previous Agriculture, Natural Resources and Environment Panel for which it the remit had been too wide. New Panel members are being invited to join the Panel from both business and academic backgrounds.
- A team from ICON consultants at Imperial College have been commissioned to review, analyse and focus the first year Foresight findings for the new Panel.
- A number of dissemination events have been organised, whilst a staged press campaign has commenced with a series articles in a number of targeted journals.

FUTURE PLANS

- It is intended that a number of Foresight priority sub-themes identified in the ICON study will be developed by Panel sub-groups to structure the dissemination programme and to aid understanding and implementation.

ANNEX C

TECHNOLOGY FORESIGHT STEERING GROUP

Sir Robert May	Chief Scientific Adviser to the Government and Chairman of the Steering Group
Professor Ronald Amann	Chief Executive, Economic and Social Research Council
Ms Barbara Beckett	General Manager, Business Development, W H Smith
Mr Brian Blunden OBE	PIRA International and President of AIRTO
Professor Mike Brady	Head of Engineering Science, University of Oxford
Sir John Cadogan CBE	Director General of the Research Councils
Mr John Chisholm	Chief Executive, Defence Evaluation and Research Agency
Dr Kenneth Gray CBE	Technical Director, Thorn EMI
Mr Richard Jones	Director of Engineering, Sony (South Wales)
Mr Pen Kent	Executive Director, Bank of England
Mr Alistair MacDonald CB	Deputy Secretary, DTI, Head of Industry Command
Mr Robert Margetts	Executive Director, ICI
Professor John Sizer CBE	Chief Executive, Scottish Higher Education Funding Council
Mrs Suzanne Warner	Head of Government Relations, Cable and Wireless plc

Advisers to Steering Group

Dr Joe Anderson	Wellcome Trust
Mr Ben Martin	Science Policy Research Unit, University of Sussex
Dr Oliver Sparrow	Shell UK Limited and the Royal Institute of International Affairs

ANNEX D

SUMMARY OF ACTIVITIES OF PROFESSIONAL AND TRADE ASSOCIATIONS AND LEARNED SOCIETIES

Professional associations, trade organisations and the learned societies were invited to make their own report on their contributions to the Foresight process. What follows has been drawn from their submissions to the Chief Scientific Adviser.

Organisations Represented

ABPI - The Association of the British Pharmaceutical Industry

AIRTO - Association of Independent Research and Technology Organisations

AURIL - The Association for University Research and Industry Links

CIA - Chemical Industries Association

IChemE - The Institution of Chemical Engineers

IEE - The Institution of Electrical Engineers

IOM - The Institute of Materials

IOP - The Institute of Physics

The Institution of Civil Engineers

The Royal Academy of Engineering

IMechE - Institution of Mechanical Engineers

The Royal Society

The Royal Society of Edinburgh

The Royal Society of Chemistry

ABPI - The Association of the British Pharmaceutical Industry

12 Whitehall London SW1A 2DY Telephone 0171 930 3477 Facsimile 0171 7471411

Following the publication of the Sector Panel and Steering Group reports much of the Association's Technology Foresight related activities have been focused on the dissemination of information about the programme and about new initiatives arising from it. A senior level Technology Foresight Working Party was established to review issues arising from the Programme and to provide some assistance in helping the Association focus on key initiatives of relevance to the pharmaceutical industry. Although it is recognised that the work of all the sector panels could have some relevance to the pharmaceutical industry, the present focus is on the application and development of subjects raised in the Health & Life Sciences Panel, to which the Association has been recently appointed. Where appropriate, the ABPI has facilitated input into the Chemicals Panel through the Chemical Industries Association (CIA), who are taking the lead in this area.

The Association has continued throughout the year to circulate widely to its member companies much relevant documentation relating to Foresight. Information has been sent to all Research and Medical Directors in the industry, and has been a permanent discussion topic in meetings of the Association's senior Medical, Scientific and Biotechnology Committees.

It is essential that others in the industry outside the R & D function are aware of the Technology Foresight initiative. To this end the Director-General has reported on progress at the ABPI Conferences for Chief Executives.

Much of the Association's recent efforts on Foresight have been in the encouragement of member companies to seek some involvement in Foresight Challenge. To stimulate the generation of project ideas the ABPI Technology Foresight Working Party identified some possible target areas which were put to the membership for consideration. The ABPI also provided input into other projects that were being developed in areas which its members were thought to have an interest, eg ageing research. The Association continues to encourage member companies to find out more about Foresight from other sources.

Details of the 1995 CBI/AIRTO conference were circulated to all companies. The ABPI Medical Committee has discussed Foresight with the NHS R & D Directorate. Representatives from the Association have met during the year with bodies such as the Royal Pharmaceutical Society, the Royal Society of Chemistry, the Higher Education Chemistry Conference, the Professional & Education Committee of the Biochemical Society, the Committee of Heads of Department of Pharmacology and the Institute of Biology to discuss issues of mutual interest (and concern) arising from the Technology Foresight Programme. Further discussions are planned with the CVCP and AURIL.

The major initiative planned by the Association in 1996 is a one day "briefing" seminar on Technology Foresight and its application to biotechnology and biomedical sciences. The meeting is being held in conjunction with the BioIndustries Association (BIA) with support from the DTI (Chemical and Biotechnology Division).

AIRTO - Association of Independent Research and Technology Organisations

PO Box 330, Cambridge, CB5 8DU Telephone 01223 467831 Facsimile 01223 462051

AIRTO, in conjunction with the CBI, held a one-day workshop on 23 October on the theme of Turning Foresight into Action.

The AIRTO members who have a responsibility for a technology or sector of industry have analysed the Foresight recommendations and extracted those which are applicable to their particular sector or interest group. AIRTO members have conveyed or are about to convey this information to their Sectors by means of newsletters, workshops, seminars etc .

A number of AIRTO members have participated in Foresight Challenge bids as a means of accelerating the exploitation of the Foresight recommendations.

The representation of AIRTO members has increased on a number of Foresight Sector Panels, whilst the President of AIRTO has been appointed to the Foresight Steering Group.

AURIL - The Association for University Research and Industry Links

AURIL Secretariat, 29 Tavistock Square, London WC1H 9EZ Telephone/Fax 01403 823108

AURIL represents virtually all UK universities through their Heads of Industrial Liaison Offices (ILOs) - or similar. The Association's contribution to the Foresight Programme's objectives is in part via individual member ILOs. In addition:

AURIL member ILOs are commonly the recipients of Foresight documents, reports and information and they disseminate this within their universities. This often extends to influencing research policy and incorporating Foresight priorities and objectives into collaborative relationships with Industry.

AURIL has had substantial discussions with both OST and DTI (Technology and Innovation), part of which related to AURIL's role in the raising of academic and other awareness of the Foresight findings.

In 1996 the AURIL Autumn Conference is also likely to be focused on Foresight implementation.

The Association is in a good position to raise awareness of the relevance and impact of the Technology Foresight Programme in a constructively critical manner. AURIL is following up other potential collaboration with the OST Foresight team.

CIA - Chemical Industries Association

Kings Buildings, Smith Square, London, SW1P 3JJ Telephone 0171-834 3399 Facsimile 0171-834 4469

The CIA plans to take forward the findings of its research priorities study, in conjunction with those of the Chemicals Foresight Panel, on which it is represented, through a group representing the "chemicals community": CIA, RSC, IChemE, DTI, OST and other sector associations where necessary. This group is planning a series of workshops to disseminate Foresight more widely, and to spur action through the establishment of common interest groups to address particular research and technology needs. The first of these workshops was held at the Trafford Park Manufacturing Institute on 23 November, attended by approximately 120 industrialists, academics and government representatives. Further workshops are to be held throughout the regions over the coming 6 months (the DTI offices are playing an instrumental part in co-ordinating and planning these).

The Association has disseminated its research and technology needs within EPSRC, BBSRC and NERC, strengthening the links between the Research Councils and the industry. The first fruits of this relationship include:

A business process engineering programme;

A better appreciation of the chemical sector as a user base for projects under the Innovative Manufacturing Initiative; and

The establishment of NERC's Environmental Diagnostics Programme.

CIA was instrumental in bringing together the industrial community to the proposal for an Institute of Applied Catalysis forward. Working together with the RSC and IChemE, an outline proposal has now been submitted to which the "chemicals community" can subscribe. Here, and elsewhere, the strong involvement of the Specialised Organics Sector Association, SOCSA (a sector association within the CIA), has been extremely valuable, ensuring that the views of smaller, often highly innovative companies, are taken into full account.

For the future, the CIA has identified a need to ensure that the UK Foresight exercise is used effectively to influence support for research and technological development under the Fifth EU Framework Programme. Through CEFIC, the European Federation, CIA is committed to ensuring that this happens through effective dialogue with OST, the DTI, CBI and the relevant European bodies. This aspect of Foresight implementation will be a key priority over the coming six months or so.

IChemE - The Institution of Chemical Engineers

Davis Building 165-189 Railway Terrace Rugby CV21 3HQ Telephone 01788 578214 Facsimile 01788 560833

The Institution of Chemical Engineers continues to be an enthusiastic supporter of the Technology Foresight process, and its primary goal of generating a structured vision to inform Government decisions on R & D expenditure. The Institution has identified five themes of relevance to the Chemical Engineering area, and these are the basis of its continuing responses to, and interaction with, funding bodies such as EPSRC, DTI and BBSRC on their programmes. The five themes are: the need to fund the infrastructure, the importance of multi-disciplinarity, the need for a conceptual view of chemical engineering (applying the techniques to business processes), importance of the product/process interface, and the need to link research with education.

The IChemE has joined with chemists, and industry, in putting together a proposal for an Institute of Applied Catalysis. Such an Institute would bring together chemists and engineers at the forefront of a vital technological area. The formation of a "Subject Group" is being planned to develop the business process theme, which is a key part of the Innovative Manufacturing Initiative. The findings of the Foresight Panels have been sent to the Institutions other Subject Groups, recommending that these are incorporated in their programmes/events throughout the coming year. This will help bring the Foresight messages to some 4,500 professionals, some 30% of whom are in scientific and technical disciplines outside of Chemical Engineering. Specific inputs are already being made to the activities of the Energy and Materials Panels.

In February 1996, the IChemE Research Committee will hold a meeting to discuss multidisciplinary research at the chemistry/chemical engineering interface with chemistry professionals. A prestigious lecture at the Annual Research meeting will be given by a member of the ITEC Foresight Panel, sharing the IT future vision. The Research Committee also intends to shadow the deliberations of the ongoing Foresight Programme. The mechanism for this initiative will be consolidated once more information on the further activity has been received from OST/DTI.

IEE - The Institution of Electrical Engineers

Savoy Place London WC2R 0BL Telephone 0171-240 2872 Facsimile 0171-240 7735

The Institution's involvement in Foresight goes back to 1992 with its input to the Science and Technology White Paper and has continued with the provision of substantial numbers of nominations to the Foresight Panels and in the making of submissions to the Panels.

Specific Actions in Support of the Programme include:

> Involvement in the London launch of the DTI's Electronics and Engineering Division Technology Foresight Outreach Programme in Mechanical and Electrical SMEs;
>
> The organisation of a half day seminar as part of SET 96 Foresight Day;
>
> The organisation during 1996 of a series of awareness workshops in the regions using the IEE UK Centres organisation. The Workshops will not focus on any particular panel's recommendations and each will be addressed by a speaker from OST and from one of the panels. The open meetings will be invited to advise the Centres as to the sectors on which they should focus future events in terms of either education and training, research or communications infrastructure.

Actions are being considered to:

> Organise an awareness workshop for the Institution's Industrial Affiliates;

Establish working groups to develop selected Panel recommendations further;

Badge existing programmes and material which support the Technology Foresight Programme.

IOM - The Institute of Materials

1 Carlton House Terrace London SW1Y 5DB Telephone: (0171) 839 4071 Facsimile:(0171)823 1379 ·

The Institute has been an active supporter of, and participant in, the Technology Foresight Programme and has conducted three materials foresight studies using its own methodology. It has taken some actions to secure implementation of priorities identified in these programmes, and others are planned

IOM members were active on the Materials Sector panel (as Chairman, Vice Chairman and members) and other panels during the study. The Chairman and Vice-Chairman co-authored an article on the materials report in Materials World which is distributed to the Institute's 18,000 members. IOM has collaborated with OST in the planning and publicity for a Biomaterials Foresight workshop on 13 December. Dr Campbell is to speak at a dissemination meeting on 18 January 1996 for the IOM's South East members and other regional presentations on materials, probably jointly with IMechE, are being planned with OST

The IOM studied Materials Foresight for three sectors - power generation, biomaterials and aerospace. Reports have been issued and widely disseminated to senior representatives of industry, government, and universities. The Defence and Aerospace panel identified seven technological priorities, one of which was materials and structures. It commended the IOM report as the way to examine its six other technological priorities.

Two industrially led task forces - for advanced fossil power generation and for aerospace - have been formed. They are aiming to provide a focus for research into materials for their sector.

The IOM report made recommendations concerning Centres of Excellence for research, training in the science, technology and use of materials, co-ordination of the committees concerned with materials for aerospace and other issues. Follow up action is planned or in hand for these recommendations.

The Institution of Civil Engineers

Great George Street Westminster London SW1P 3AA Telephone 0171-222 7722 Facsimile 0171-222 7500

The Institution is currently examining the Sector Panel reports to identify all the recommendations that have a direct impact on the construction sector. This includes the Energy, Transport, Materials and Environment sectors. A report will be prepared in due course.

A working party has been established to take forward the recommendation of the Construction Panel concerning competitive infrastructure. The group recently submitted a proposal under the DoE's Partners in Technology Programme for a project of over £200,000 including two studies designed to enhance the UK construction industry's ability to compete more effectively in overseas markets, which are seen as crucial to the future prosperity of the industry.

IOP - The Institute of Physics

76 Portland Place London W1N 4AA Telephone 0171-235 6111 Facsimile 0171-259 6002

During the first phase of Foresight, the Institute undertook numerous activities, including:

Production of a booklet listing the main contacts within the Foresight Programme, together with details of IOP members' involvement, and have distributed this widely, free of charge.

Setting up of shadow panels to follow the work of the Foresight exercise.

The production of a booklet containing its members' views of Technology and Application Trends over the next 10-20years, to mirror similar work by the Foresight Panels, and have distributed this widely, free of charge.

The making of formal submission of the Institute's views to eleven of the fifteen Foresight Sector Panels.

Following publication of the Foresight reports, the Institute has:

Published numerous feature articles and comment in *Physics World,* its monthly magazine for members, and in its thrice-yearly newsletter, *Physics In Business.* This has included a Foresight Progress summary in the October 1995 edition of *Physics In Business.*

Run a major three day Foresight dissemination conference in May 1995;

Distributed complementary sets of Foresight summary reports directly to the IOP's main contacts in industry and business;

Acted as intermediary in making the full Foresight reports readily available to IOP members;

Received a grant from the DTI for the preparation of a report to disseminate the recommendations of Foresight to the small technology-based business sector, including through its SME (Small- and Medium-size Enterprise) Club. A telephone survey of recipients was also undertaken and the results have been passed to the DTI;

Agreed to organise a series of workshops in collaboration with the OST and the DTI of Foresight Day during Science, Engineering and Technology Week 1996.

For the future the IOP intends to keep the Programme under review, and to respond with new actions and initiatives as the need and opportunity arises.

The Royal Academy of Engineering

29 Great Peter Street Westminster London SW1P 3LW Telephone 0171-222 2688 Facsimile 0171-233 0054

Foresight pervades the Academy's planning for current and future activities. One indicator of this is that the subject has been discussed at every Academy Council meeting during 1995. In addition, the various standing committees, of their own volition, have warmed to the theme of Foresight in their deliberations on future activities and programmes.

The Academy tends to concern itself with the policy end of the spectrum of Foresight activities, the engineering institutions being often well equipped to deal with sectoral detail. Nevertheless, this year the Academy will have run two events on the subject of Foresight, namely:

> "Convergence in Communications - Foresight's Message" - a one-day symposium held in London on 23 June 1995
>
> "Technology Foresight - a new Dawn?" a lecture by Mr. Rob Margetts FEng (Member of the Foresight Steering Group) at the University of Newcastle upon Tyne on 5 December 1995.

The Academy is establishing a new scheme, known as Engineering Foresight Awards (EFAs). EFAs are designed to promote engineering secondments overseas in fields highlighted by the Technology Foresight Programme as being critical to the twin goals of UK wealth creation and quality of life improvement. It is believed that this new scheme will play a useful role in promoting Foresight more widely.

IMechE - Institution of Mechanical Engineers

1 Birdcage Walk London SW1H 9JJ Telephone 0171-222 7899 Facsimile 0171-222 4557

The institution has disseminated the Foresight proposals throughout its technical structure of industry divisions and technology groups. In particular, the key technologies needed by industry were analysed.

A number of specific actions have been taken:

> Business Process Engineering was highlighted by the manufacturing panel. As a result, the Engineering Manufacturing Industries Division ran a very successful seminar on the subject in Coventry. On 30th November 1995, in conjunction with the EPSRC Innovative Manufacturing Initiative.
>
> The institution is working closely together with the Institute of Materials, in particular, being involved in the one-day seminar on biomaterials held on 13th December 1995 by the London & South East Government Office. The Institution is jointly working with the Institute of Materials on a proposal for three regional seminars, while the Chairman of the Materials Panel has addressed the IMechE's Materials Group.
>
> The journal *Professional Engineering* has regularly included articles outlining the Technology Foresight Reports

As part of an initiative with the new Engineering Council, the IMechE will act as the Institutions' focus on initiatives in the field of Energy. As part of this, a report will be commissioned early in 1996 dealing with the future situation for energy and directly relating this to actions needed by Industry, Government, Academia and the Engineering Institutions. In this report, the Technology Foresight reports will be heavily drawn upon as well as the recent reports prepared jointly by the Royal Society, the Royal Academy of Engineering and the British Medical Association.

The Royal Society

6 Carlton House Terrace London SW1Y 5AG Telephone 0171-839 5561 Facsimile 0171-930 2170

The Royal Society has taken a close interest in the Technology Foresight Programme from the beginning. In October, Council issued a statement on the strengths and weaknesses of the first phase, reflecting the experiences of the scientific community and emphasising the benefits of the networking achieved to date. That statement also highlighted the conditions under which the Science base could most effectively contribute to the goals underpinning Foresight.

Part of the Royal Society's strengths lies in its ability to identify and support the best scientists through a wide variety of schemes, including research appointments and international exchanges. The Society believes that this role complements the more mission-orientated approach of the Research Councils. Through these schemes, the Society is able to contribute to the creation of the knowledge base for future exploitation and to facilitate the global networking that is essential to early identification of Foresight opportunities worldwide.

In particular, the Society is keen to promote two-way flows of information and interaction between the scientific community and industry. It is identifying how best the work and achievements of its nearly 300 Research Fellows can best be drawn to the attention of industry, commerce and other spheres of wealth creation. It has relaunched its scheme of Industry Fellowships. It is developing other academe/industry and commerce initiatives such as the Industry lectures and the City/Science programme.

The Society will continue to monitor development of the Foresight initiatives and to look for opportunities, within its niche, to further the broad strategic aims of Technology Foresight.

The Royal Society of Edinburgh

22-24 George Street, Edinburgh EH2 2PQ Telephone 0131-225 6057 Facsimile 0131-220 6889

The Royal Society of Edinburgh (RSE) has fully supported Technology Foresight since its inception and as taken a number of actions to assist with dissemination and implementation of Foresight conclusions and recommendations within Scotland. The following summarises these activities.

The RSE supported a major meeting (organised by IBM and Scottish Enterprise) concerning "Technology Foresight - The Scottish Dimension" in Glasgow in November 1994. This meeting addressed the relationship of Foresight to the Scottish economy and was attended by leading industrialists, academics and government officials. Following the publication of the Foresight reports, the RSE convened a meeting in Edinburgh in June 1995 to address the way forward for Foresight in

Scotland.

RSE has hosted a number of meetings on Foresight, including a Financial Services Panel discussion and a round table on SHEFC's consultation document, "Addressing Technology Foresight". The latter was attended by CBI(Scotland), The Scottish Office, Scottish Enterprise, SHEFC and the Scottish Council (Development and Industry).

The RSE has formed a broadly-based Working Party of Fellows to encourage dissemination and implementation of Foresight themes, priorities and recommendations in the Scottish context. Close interactions with The Scottish Office Education and Industry Department and the OST have been established.

The working party is addressing the relationship of Scottish business and quality of life needs to Foresight priorities and recommendations. The intent is to construct a series of sectoral analyses which will assist in Foresight dissemination to a wider audience and which, in addition to taking account of broader UK issues, will focus attention on Scottish items which should be addressed during the implementation phase.

RSE is planning a series of "RSE Technology Foresight" seminars. These will allow top R&D executives and strategists from the research headquarters of inward-investing and other non-Scottish technology companies to discuss their technology strategies with local businesses (including SMEs) and Scottish HEI researchers. In addition, the seminars will be a showcase for indigenous capabilities. In this way it is hoped to bridge the gap between company and UK Foresight, inform our researchers and local companies about the R&D directions of international organisations and promote beneficial relationships between corporate and Scottish R&D.

The Royal Society of Chemistry

Burlington House Piccadilly London W1V 0BN Telephone 0171-437 8656 Facsimile 0171-437 8883

The Royal Society of Chemistry (RSC) has been involved at all levels in every aspect of the Technology Foresight Programme.

Throughout 1995, the Society has disseminated the findings of the Foresight Panels in general and the Chemical Panel in particular. The Vice-Chairman of the Chemicals Panel was invited to join the staff of the RSC to facilitate the dissemination process. Technology Foresight was an integral part of two RSC workshops held in February 1995 and in the first RSC/IChemE/CIA/DTI Regional workshop held more recently.

The majority of the RSC's members (45000 in total) are being reached through the Society's Subject Groups which represent a major proportion of the UK's technical expertise in chemistry. Each of the 60 Subject Groups has been asked to consider Technology Foresight, provide feedback on the findings and consider opportunities in their area for appropriate action.

Numerous presentations have been delivered on Technology Foresight to the RSC Council, Divisions and Local Sections. As a result of these discussions, the Scientific Affairs Board of the RSC has asked all Subject Groups to develop their own "forward look" to provide a stronger and more systematic input from the broad community of chemistry practitioners. This and the feedback will be collated and made available to the Foresight Panels during 1996.

The RSC is planning further workshops to continue the penetration of Foresight into the wider chemistry community. The dissemination process will continue to be supported through regular articles in *Chemistry in Britain* as well as the work of the coordination group formed with the CIA, IChemE, OST and DTI.

To raise the profile of chemistry amongst the public at large, the RSC has launched the Huddersfield project. This is a series of events that address a number of the issues raised by Foresight and represents a collaboration of industry, OST, and the RSC.

ANNEX E

WHITEHALL FORESIGHT GROUP

MANDATE OF THE GROUP

The Whitehall Foresight Group is a committee formed of the departmental Foresight Action Managers who act as foci for all the Foresight-related initiatives within their respective departments. The role of the Group is to review the recommendations arising from the Technology Foresight reports and to identify the further actions required and to coordinate activities across departments. The Group is particularly concerned with the underlying infrastructure issues that support and influence the development and exploitation of science and technology.

GROUP MEMBERSHIP

Department	Official	Comments
Office of Science and Technology	Mrs Helen Williams	Chair, Head of Transdepartmental Science and Technology Group
Office of Science Technology	Mr Ian Freeman	Deputy Chair, Head of and Technology Foresight and Wealth Creation Division
Department of the Environment	Dr Alan Apling	Head, Chief Scientist Group
Ministry of Agriculture Fisheries and Food	Mr John Suich	Head, Research Policy Co-ordination Division
Foreign and Commonwealth Office	Mr Graham Boyce	Head, Environment, Science and Energy
Department of Health	Dr Peter Greenaway	Chief Scientific Officer
Ministry of Defence	Mr Paul Sutcliffe	Deputy Chief Scientist (Research and Technology)
Department of Trade and Industry	Dr David Evans	Head of Technology and Innovation Policy Division
HM Treasury	Mr Craig Pickering	Head of Industry Division

Welsh Office	Dr Ron Loveland	Director of Business Services Division
Scottish Office	Mr Tom Kelly	Education and Industry Department
Department of National Heritage	Mr Robin MacLachlan	Head of Strategy & Systems Division
Northern Ireland Office	Mr David Duncan	Director, Industrial Research and Technology Unit
Overseas Development Administration	Dr Ian Haines	Head, Natural Resources Research Department
Department of Transport	Dr David Metz	Chief Scientist
Department for Education & Employment	Ms Katherine Fleay	Higher Education
	Mr John Fuller	Employment
Health & Safety Executive	Mr James McQuaid	Director, Strategy and General Division and Chief Scientist

dti

press notice

INFORMATION SERVICE
MAY 1996
Wellcome Centre for Medical Science

P/96/178 6 March 1966

FORESIGHT WORTH £200 MILLION

First Progress Report of the Technology Foresight Programme published

- A £36 million initiative to fund research equipment in Foresight priority areas.

- Firms and universities coming together in a £60 million Foresight Challenge Competition.

- Ten new LINK Programmes worth £70 million responding to the Foresight priorities.

- New Programmes in the Research Councils.

- Over 100 Foresight events held since last May.

- Twelve thousand people in contact with Foresight through the Programme's newsletter.

These are just some of the first fruits of the continuation of the Technology Foresight Programme announced by Science and Technology Minister Ian Taylor today:

"I think everyone is impressed with the sustained drive and enthusiasm which the Technology Foresight panels have demonstrated. That enthusiasm is infectious - we now have dozens of other organisations actively pursuing the Foresight agenda on their own initiative. The Progress Report published today can only touch on the extent of their efforts.

“Following the launch of its initial findings last year the UK Technology Foresight Programme has gone from strength to strength. It is already making a difference. The Programme is being used to promote: better use of the science base; shared visions of the future; and better communication between business, academia and government.

“This has been possible through the intensive work of the sixteen Foresight panels and OST who have succeeded in involving many organisations in Foresight: Professional Institutions; industry bodies; Government Departments; Research Councils and universities.

“The First Progress Report of the Technology Foresight Programme provides a first assessment of how the Programme is being taken forward, the goals for the second phase, the achievements so far and a look ahead to the evaluation of the Programme.”

Notes For Editors

1. The Technology Foresight Programme is a major initiative which was announced in the 1993 White paper 'Realising our Potential'. The Programme brings together industry, academia and Government to identify: trends in markets and technology over the next 10-20 years; opportunities for the UK arising from these trends; and actions which should be taken now to benefit from these opportunities.

2. The Programme is driven forward by 16 independent Technology Foresight panels (see attached table for panels, chairmen and secretaries).

3. The panels' independent reports were published last Spring, with an overarching report published in May, titled "Progress Through Partnership - report from the Steering Group of the Technology Foresight Programme 1995".

   Copies of these reports are available from HMSO, tel: 0171 873 9090.

   Summary leaflets of the reports are available from OST, Fax: 0171 271 2015.

   Media copies of summary leaflets and/or the reports are available from DTI Press Office by telephoning the number below.

4. The Foresight Challenge is a competition, with bids to undertake work on one or more of the priority recommendations in the sixteen Foresight reports. Copies of the Foresight Challenge document are available from the OST, Fax: 0171 271 2015.

5. LINK is the UK Government's principal mechanism for supporting collaborative research in partnership between the public and private sectors. For more information contact LINK on Fax: 0171 238 2857.

6. For subscription information on Foresight News, Newsletter of the Technology Foresight Programme contact OST, Fax: 0171 271 2015.

7. Copies of the First Progress Report of the Technology Foresight Programme are available from the OST, Fax: 0171 271 2015.

Press enquiries: 0171 271 2014
(Out of Hours: 0171 215 5110/5600)
Public Enquiries: 0171 215 5000

THE PANELS OF THE TECHNOLOGY FORESIGHT PROGRAMME

Panel	Chairman	Secretary
Agriculture	Prof John Hillman Scottish Crop Research Institute	Dr David Rawlins Tel 0171 271 2092
Chemicals	Dr John Beacham ICI Chemicals & Polymers Ltd	Dr Andrew Clark Tel 0171 271 2093
Construction	Mr Herb Nahapiet John Mowlem & Co Ltd	Ms Anita Longley Tel 0171 271 2117
Defence & Aerospace	Mr Tony Edwards Messier-Dowty Int	Mr Martin Sheppard Tel 0171 271 2121
Energy	Dr Gordon McKerron SPRU	Ms Anita Longley Tel 0171 271 2117
Financial Services	Mr Michael Hughes Barclays de Zoete Wedd	Dr Graeme Reid Tel 0171 271 2048
Food & Drink	Prof Peter Lillford Unilever Research	Dr David Rawlins Tel 0171 271 2092
Health & Life Sciences	Prof Mark Ferguson University of Manchester	Mr Brian Bradley Tel 0171 271 2115
IT, Electronics & Communications	Dr John Taylor Hewlett Packard Labs, Bristol	Mr Martin Boyle Tel 0171 271 2118
Leisure & Learning	Mr Peter Wallis SRU Ltd	Ms Nicola Parkins Tel 0171 271 2102
Manufacturing, Production & Business Processes	Dr David Grant GEC Plc	Mr Michael Murphy Tel 0171 271 2116
Marine	Mr David Goodrich British Maritime Technology Ltd	Mr Michael Murphy Tel 0171 271 2116
Materials	Dr John Campbell Cookson Group Plc	Mr Brian Bradley Tel 0171 271 2115
Natural Resources & Environment	Prof Kerry Turner University of East Anglia	Mrs Elizabeth Enthoven Tel 0171 271 2108
Retail & Distribution	Dr Graham Winfield Booker-Tate Ltd	Ms Sue Armfield Tel 0171 271 2045
Transport	Mr Stephen Gibbs Docklands Light Railway	Mrs Elizabeth Enthoven Tel 0171 271 2108

FORESIGHT 2000

Minister for Science and Technology
Mr Ian Taylor MBE MP

Members of the Technology Foresight Steering Group

Chairman
Sir Robert May FRS

Sir John Cadogan CBE FRS

Dr Kenneth Gray CBE

Mr Robert Margetts FEng

Professor John Sizer

Mr Richard Jones

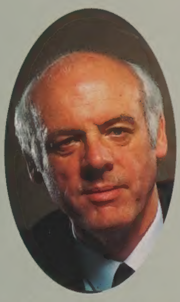
Mr Pen Kent

Professor Mike Brady FEng

Mr John Chisholm

Mr Alastair Macdonald CB

Mrs Suzanne Warner


Professor Ronald Amann

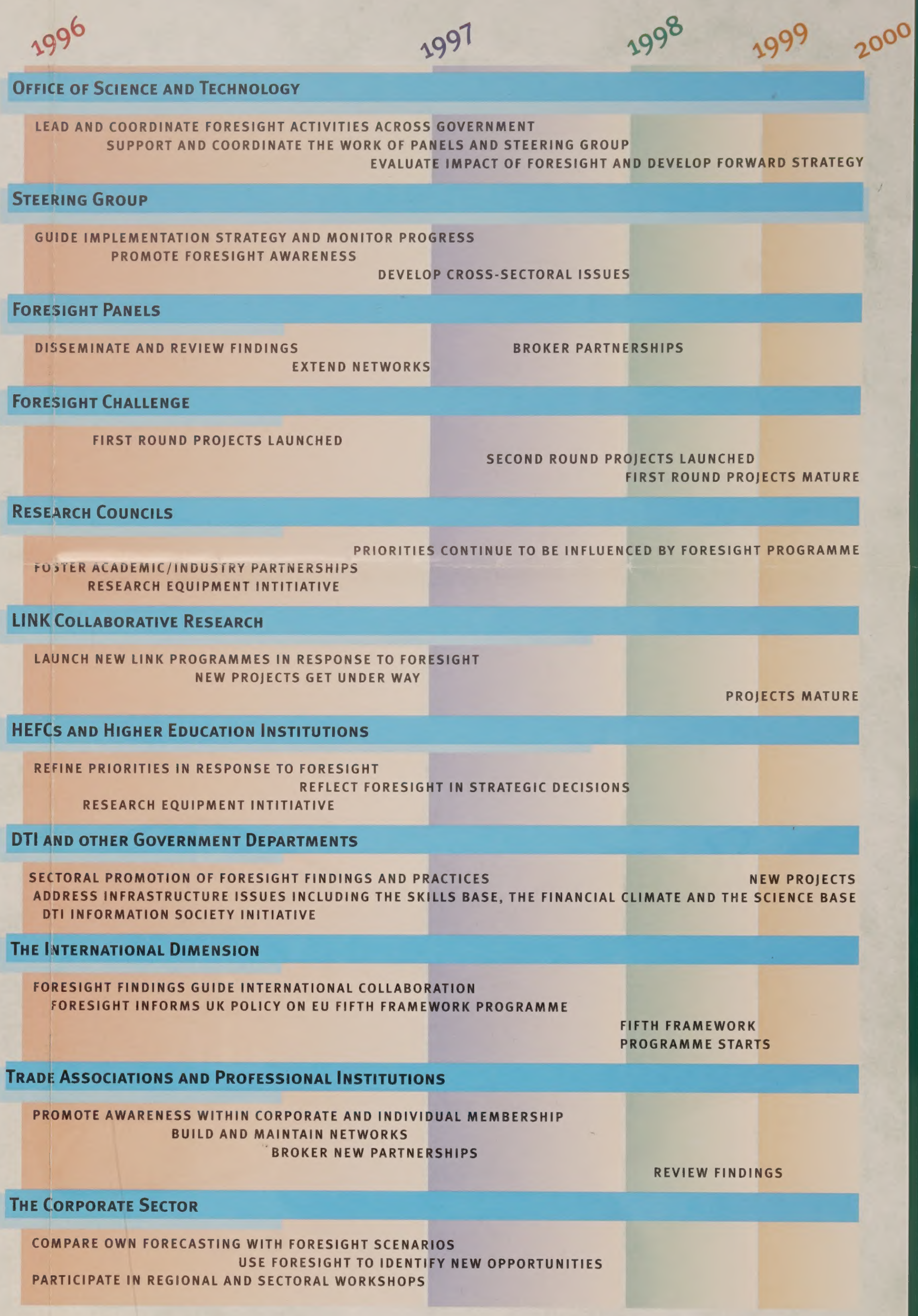
Ms Barbara Beckett

Mr Brian Blunden OBE

Dr Joe Anderson

Dr Oliver Sparrow

Mr Ben Martin



Office of Science and Technology

LEAD AND COORDINATE FORESIGHT ACTIVITIES ACROSS GOVERNMENT
SUPPORT AND COORDINATE THE WORK OF PANELS AND STEERING GROUP
EVALUATE IMPACT OF FORESIGHT AND DEVELOP FORWARD STRATEGY

Steering Group

GUIDE IMPLEMENTATION STRATEGY AND MONITOR PROGRESS
PROMOTE FORESIGHT AWARENESS
DEVELOP CROSS-SECTORAL ISSUES

Foresight Panels

DISSEMINATE AND REVIEW FINDINGS
EXTEND NETWORKS
BROKER PARTNERSHIPS

Foresight Challenge

FIRST ROUND PROJECTS LAUNCHED
SECOND ROUND PROJECTS LAUNCHED
FIRST ROUND PROJECTS MATURE

Research Councils

PRIORITIES CONTINUE TO BE INFLUENCED BY FORESIGHT PROGRAMME
FOSTER ACADEMIC/INDUSTRY PARTNERSHIPS
RESEARCH EQUIPMENT INTITIATIVE

LINK Collaborative Research

LAUNCH NEW LINK PROGRAMMES IN RESPONSE TO FORESIGHT
NEW PROJECTS GET UNDER WAY
PROJECTS MATURE

HEFCs and Higher Education Institutions

REFINE PRIORITIES IN RESPONSE TO FORESIGHT
REFLECT FORESIGHT IN STRATEGIC DECISIONS
RESEARCH EQUIPMENT INTITIATIVE

DTI and other Government Departments

SECTORAL PROMOTION OF FORESIGHT FINDINGS AND PRACTICES
NEW PROJECTS
ADDRESS INFRASTRUCTURE ISSUES INCLUDING THE SKILLS BASE, THE FINANCIAL CLIMATE AND THE SCIENCE BASE
DTI INFORMATION SOCIETY INITIATIVE

The International Dimension

FORESIGHT FINDINGS GUIDE INTERNATIONAL COLLABORATION
FORESIGHT INFORMS UK POLICY ON EU FIFTH FRAMEWORK PROGRAMME
FIFTH FRAMEWORK PROGRAMME STARTS

Trade Associations and Professional Institutions

PROMOTE AWARENESS WITHIN CORPORATE AND INDIVIDUAL MEMBERSHIP
BUILD AND MAINTAIN NETWORKS
BROKER NEW PARTNERSHIPS
REVIEW FINDINGS

The Corporate Sector

COMPARE OWN FORECASTING WITH FORESIGHT SCENARIOS
USE FORESIGHT TO IDENTIFY NEW OPPORTUNITIES
PARTICIPATE IN REGIONAL AND SECTORAL WORKSHOPS

Sector Panel Chairmen

AGRICULTURE
Professor John Hillman FRSE

CHEMICALS
Dr John Beacham

CONSTRUCTION
Mr Herb Naphiet

DEFENCE AND AEROSPACE
Mr LA Edwards

ENERGY
Mr Gordon MacKerron

FINANCIAL SERVICES
Mr Michael Hughes

FOOD AND DRINK
Professor Peter Lillford

HEALTH AND LIFE SCIENCES
Professor Mark Ferguson

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Dr John Taylor OBE FEng

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Mr Peter Wallis

MANUFACTURING, PRODUCTION AND BUSINESS PROCESSES
Dr David Grant

MARINE
Mr David Goodrich

MATERIALS
Dr John Campbell

NATURAL RESOURCE AND ENVIRONMENT
Professor Kerry Turner

RETAIL AND DISTRIBUTION
Dr Graham Winfield CBE

TRANSPORT
Mr Stephen Gibbs

Technology Foresight is a key policy initiative first announced in the White Paper on Science, Engineering and Technology. It is coordinated by the Office of Science and Technology in the DTI. It embraces the dual themes of partnership and wealth creation. It brings together industrialists and scientists to identify opportunities in markets and technologies likely to emerge during the next 10–20 years, and the investments and actions which will be needed to exploit them.

The results of Foresight – drawing on contributions from a wide spectrum of skills and expertise – will inform decisions on spending, particularly by Government but also by industry.

For further information on Foresight, please contact The Office of Science and Technology, Albany House, 94-98 Petty France, London SW1H 9ST Fax: 0171 271 2015

Design: Chris Jones, Design for Science

STER ACADEMIC/INDUSTRY PARTNERSHIPS
RESEARCH EQUIPMENT INTITIATIVE

Collaborative Research

UNCH NEW LINK PROGRAMMES IN RESPONSE TO FORESIGHT
NEW PROJECTS GET UNDER WAY
PROJECTS MATURE

s and Higher Education Institutions

FINE PRIORITIES IN RESPONSE TO FORESIGHT
REFLECT FORESIGHT IN STRATEGIC DECISIONS
RESEARCH EQUIPMENT INTITIATIVE

nd other Government Departments

TORAL PROMOTION OF FORESIGHT FINDINGS AND PRACTICES
NEW PROJECTS
DRESS INFRASTRUCTURE ISSUES INCLUDING THE SKILLS BASE, THE FINANCIAL CLIMATE AND THE SCIENCE BASE
TI INFORMATION SOCIETY INITIATIVE

nternational Dimension

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Office of Science and Technology

DEPARTMENT OF TRADE AND INDUSTRY

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